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SOME TYPES OF CITIES IN TEMPERATE EUROPE

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A score of miles away the traveler in the Beauce sees the spires of Chartres rising from the plain, commanding the monotonous levels of this "ancient land of harvests." On closer approach the dominance of the church of the two spires is still more closely felt. For centuries Chartres has retained its original character as an agricultural market town: it has suffered little from the obscuring effects of industrialization. In the old houses clustered round the cathedral, in the markets under its shadow, in the narrow streets leading therefrom the feeling of that protective power, the medieval church, is still present.

Thus clearly and impressively Chartres presents that physiognomy of a city type characteristic of temperate western Europe. It is of this type that the present study attempts an analysis.[1] The distinctiveness of the type may perhaps be the better appreciated by a preliminary contrast with a city type of southern France.

It has often been said that the contrasts between southern and northern France, between the Roman and the Frankish country, between the Midi and the Paris Basin are very profound. In the south many important towns go back to Roman origins. In the centuries after the fall of the Roman Empire civic life was at a low ebb; yet it survived, however impoverished, and the regrowth of the town later on, usually in the earlier Middle Ages, owed something no doubt to the remains of antiquity.

THE ROMAN TRADITION IN SOUTHERN FRANCE

The Place du Forum of Arles, the Place du Capitole at Toulouse, the square with the perfect Maison Carrée at Nîmes are the centers of their

[1] Valuable historical studies of town planning have been made by many writers, and the results of several have been made available for the general reader in such books as: F. J. Haverfield's "Ancient Town Planning" (Clarendon Press, Oxford, 1913) and T. F. Tout's "Mediaeval Town Planning" (Longmans, Green & Co., London, 1917.)

The present essay in no way attempts to touch upon that field or to criticize the views of those authors; it aims rather to make an estimate of the characteristics of cities which have grown up bit by bit, using for this purpose some cities of temperate Europe.

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respective towns, and subsidiary centers are made by the remains of amphitheater and theater so that the town map has something of the appearance of a polyaster. The subsidiary streets may be tortuous, and the polyaster may be influenced by fairly late reorganizations; but the type is characteristic none the less, though with modifications and complications that

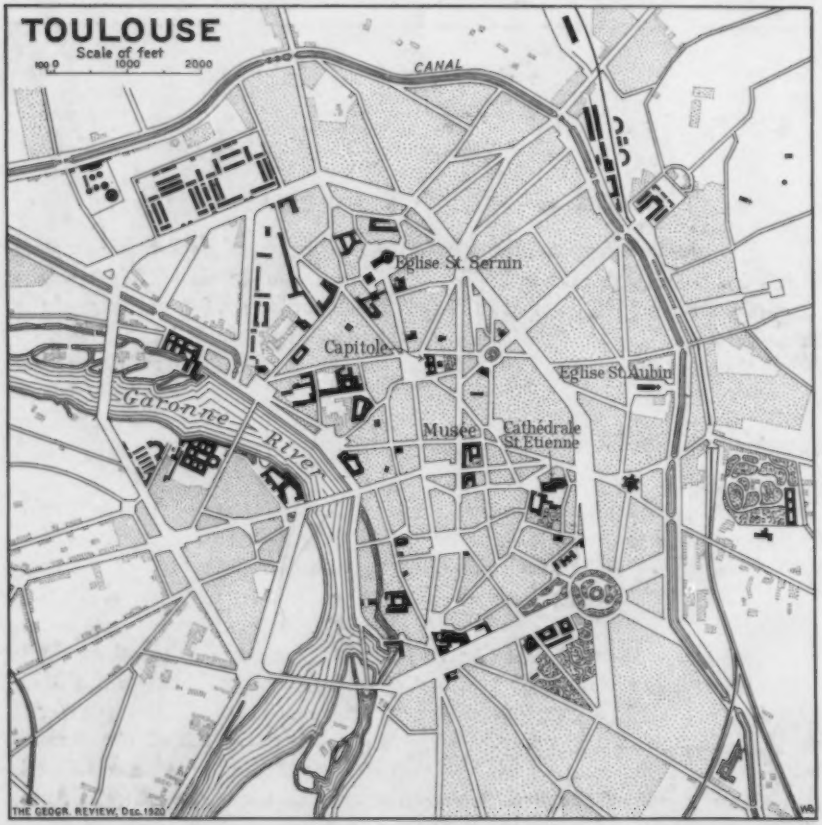

FIG. 1—Town map of Toulouse. The Capitole, or Hôtel de Ville, faces on the market place in the center of the town, while the Cathedral of St. Étienne and the fine Romanesque church of St. Sernin form subsidiary centers. The plan is typical of towns of the Roman tradition in southern France.

seem to illustrate the incoming of northern influences. The chief Christian church is not in command of the central square; it touches it in the case of Arles but only peeps in from the side, as it were. There has been continuity of urban life from Gallo-Roman days, and, when the opportunity of the medieval church arrived, it was forced in the Roman south to fit itself into the city as best it might. The cathedral of Toulouse is a poor affair, appropriately tucked away in a corner, and, though the city may well be proud of

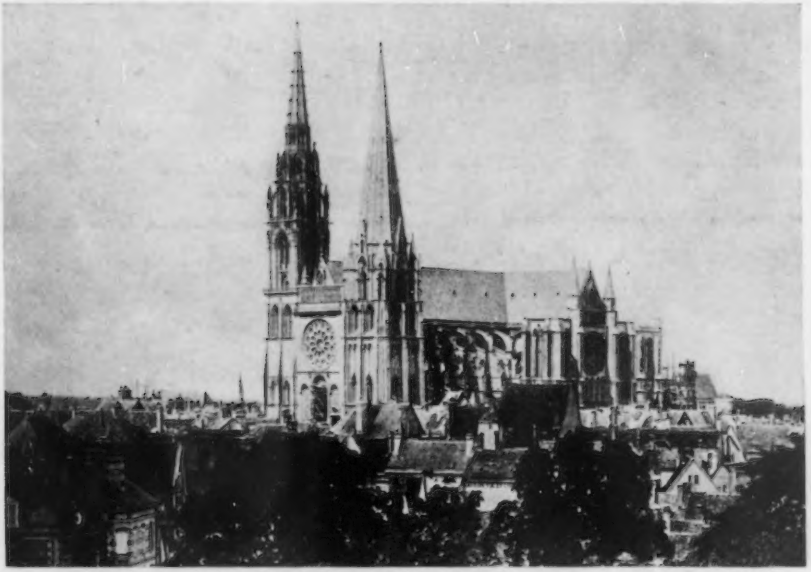

FIG. 2

FIG. 3

FIG. 2—The Cathedral of Chartres, whose twin spires command the level stretches of the Beauce. See the map of Chartres, Fig. 4. (Copyright by Brown Brothers, New York.)

FIG. 3—The Palace of the Popes at Avignon. See the map of Avignon, Fig. 13. (Copyright by Brown Brothers, New York.)

the magnificent older and Romanesque church of St. Sernin, that great monument is on a site which forms a subsidiary center right away from the Place du Capitole.

But this is not the place to discuss the towns of the Roman tradition in southern France; the short mention of them here is merely for the purpose of emphasizing the contrast between them and the typical towns of the Paris Basin. In the Paris Basin some towns, it is true, date from Roman or even

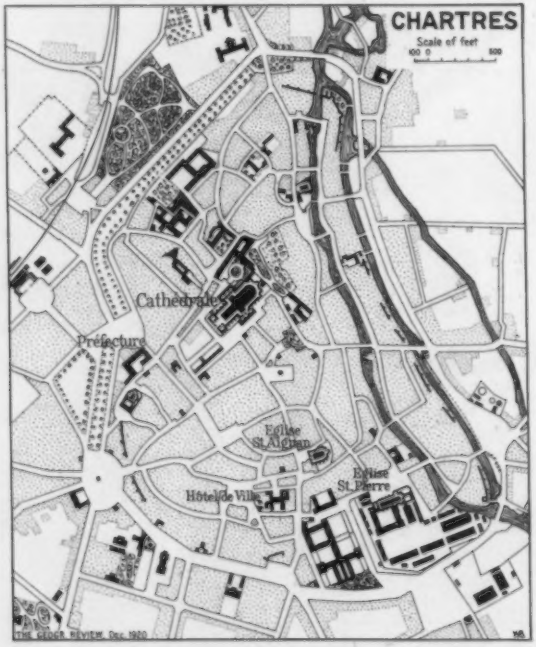

FIG. 4—Town map of Chartres. Dominance of the cathedral is typical of towns of the Paris Basin. See also Fig. 5.

earlier times, but they nearly all owe their character almost entirely to centuries subsequent to the fall of Rome; the few exceptions there and in Britain and central Europe are mostly mentioned by Haverfield.

THE TOWNS OF THE PARIS BASIN

In the Paris Basin the influx of Germanic and other invaders submerged the Roman tradition and the more effectively so because those invaders brought for the most part a rural, when not actually a semi-nomadic tradition that stood out in contrast to the urban heritage of Rome. In Roman western Europe the wealthier and more powerful persons lived in the towns and used the surrounding lands as sources of revenue, providing amphi-

theaters and other buildings in the towns as places for festival gatherings of the rural folk. In the Paris Basin it was the Frankish invader who was largely responsible for reorganization after the post-Roman chaos, and he was non-urban or even anti-urban, cultivating and improving his land and organizing it with subject cultivators, as it were, in the hope of making a self-sufficing unit. How far the manor is derived from Gallo-Roman survivals as Fustel de Coulanges will have it, or from Frankish or Saxon ideas as De Tourville argues, or from circumstances of the times which emphasized defense and militated against freedom of exchange and promoted payments

FIG. 5—Town map of Beaune.

in kind and in service, it is not to the point here to inquire. All are agreed that for a while the town was of small account.

But with the Frankish organization there went a strong effort towards forest clearing; the spread of cultivation in a corn land led inevitably to a good deal of differentiation of labor and growth of exchange. Fairs arose at several places, and markets at many more.

During the Merovingian (early Frankish) period the church won a special position attested in many ways in historic documents and based upon many facts, among which one of the chief was that churchmen were the men of learning and carried on, be it in ever so attenuated a fashion, the tradition of Roman respect for law and order.

The two complex groups of facts here merely hinted at give us the market and the church as two elements drawing men together for peace. We find the cathedral dominating the market place and the two dominating the whole town in city after city of the Paris Basin. The town is a place to

FIG. 6—View of Teschen in the seventeenth century. Note the dominance of the defensive features—thick walls and massive towers, and the fortified castle typical of a town in a "zone of strife." (From Matthaeus Merian: Topographia Bohemiae, Moraviae et Silesiae, Frankfurt, 1650.)

which the rural cultivators come to market and for festivals, and both are under the protection of the church. The church had prepared for its work by its long missionary effort on the Central Plateau where little towns cluster around a little church of hoary age.

With the growth of cultivation went increased diversity of occupation, especially in a region of mixed stock raising and corn growing, and the industrial workers gathered in the growing town in groups, occupying winding streets leading towards the market place. Many of them needed water, either for power or for the processes of industry, and the town needed water for its life; and moreover a bend of the river, especially in dissected plateau areas, offers a site for a town with reasonable facilities for defense and often a dignified position for the dominant church. We thus frequently find a town on a definite site either in the bend of a river or between a tributary and the main stream, or near a river on a hill spur that has somehow been partly isolated. Defense is important, and the walls and the castle, the river and its bridges are important features; but it is the church and the market that dominate the town.

As the town arose to meet the local needs in an area which was trying to be self-sufficient, under conditions spreading with only minor variations over the Paris Basin, it is naturally the case that the cities of the basin have a considerable likeness one to another. They are also fairly closely set, as we can well understand if we think of the difficulties of early transport and of the needs arising from the variations of stock raising and corn growing. There are some areas, however, like the plateau of La Beauce, where problems of water supply hindered town growth save in a few spots, or like the marshes of La Sologne, where towns cannot grow at all. The tortuous streets reveal the gradual growth of the town without the Roman resources and power of expression, but it may be doubted whether the crowding we associate with the old parts of the towns is always an original feature. It is probably such in some cases, but the towns are gathering places of an originally rural population, and we know from the plan of Roman Silchester and the lay-out of medieval Salisbury that rural folk coming into town wanted space for gardens.

The Cathedral the Center of Civic Life

Each craft often had its own street representing a group of workers with much co-operation in their workaday life, and the co-operation between the crafts in the life of the town as a whole centers around the church, frequently a cathedral with a bishop. The bishop was often of old a local leader rather than a part of the central organization, as he tended to be in nineteenth-century England. There would be a hospice in the town, and in many cases a great feature would be a Benedictine Abbey just outside the town, an agricultural college as well as a religious brotherhood. But the cathedral

expressed the town life most of all, however important the walls and the castle might be. It was much more than a place for religious offices; the nave was used by the citizens for many purposes, and it is interesting to

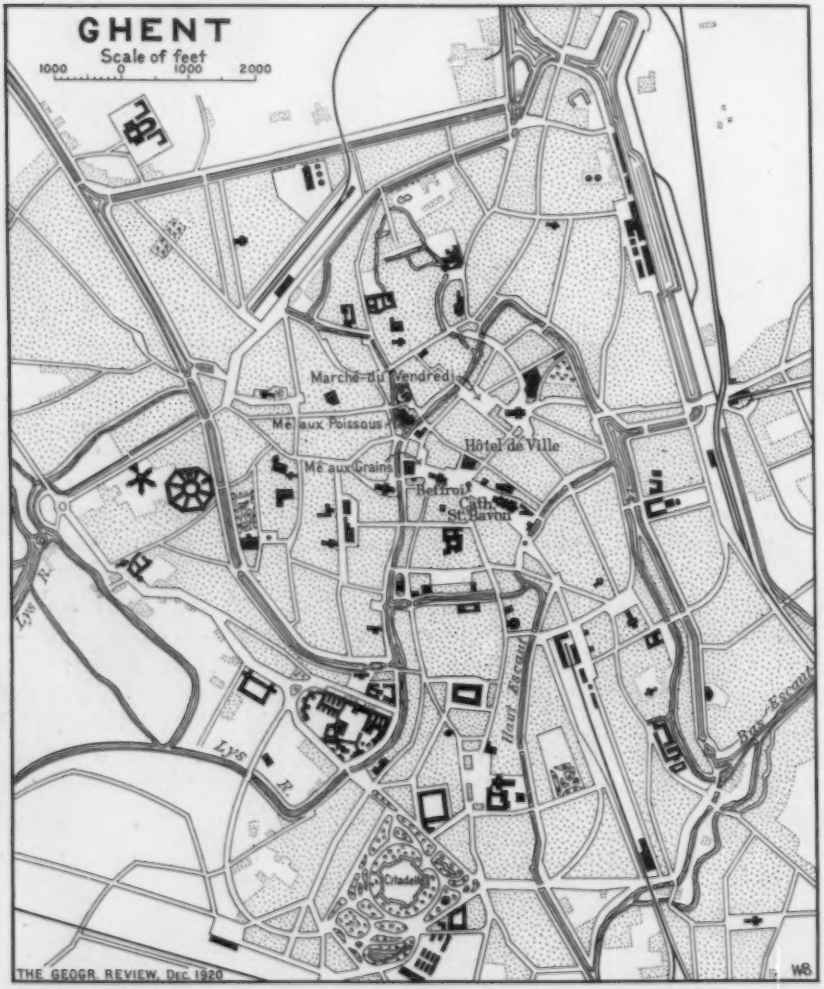

FIG. 7—Town map of Ghent. The commercial interests of Ghent are evidenced by the various markets, the largest of which, the Marché du Vendredi, was the center of the life of the medieval city, and the guild halls, the finest of which is the Maison des Francs Bateliers on the western side of the Marché aux Grains.

see French market women still coming into the church, baskets and all. The unity of the town centering in the cathedral is the leading feature in the Paris Basin. This point is emphasized here in order to enable us to follow modifications in other regions.

The larger market towns were centers to which, in the later Middle Ages, came the wealthier folk, by that time using the land for its amenities in hunting, etc., and as a source or revenue rather than a sphere of work. They built *hôtels*, i. e. mansions, some of which have become hotels in the modern sense, but it is characteristic of the Paris Basin that several have become museums and picture galleries, often of considerable local interest.

FIG. 8—View of Augsburg. The Karolinenstrasse, showing the old watch-tower and the town hall, with the towers of the cathedral in the background. (Copyright by Underwood & Underwood, New York.)

We are dealing with a country that has kept its peasantry, that has gone through many political revolutions, it is true, but has maintained a greater social continuity among the simpler folk than England has. The relation of this continuity to the broad distribution of a certain untutored taste is an interesting line of inquiry.

The decay of the abbeys has, unfortunately, transformed their neighborhood too often into a rather depressing quarter; but one can think of several cases in which that quarter is noted for hay and corn stores, stables, farriers, cart makers and menders, and small inns galore.

The variants within the Paris Basin and its borders include old towns like Caudebec-en-Caux, using for industry the water power of streams

gushing from beneath the chalk scarp, or like Falaise where the castle is unusually dominant.

Towns of the Alemannic and Flemish Borders

An interesting addition to the equipment of the town, or perhaps rather an instance of differentiation of function, appears as we leave the Île-de-France and proceed either towards the Flemish or the Alemannic borders.

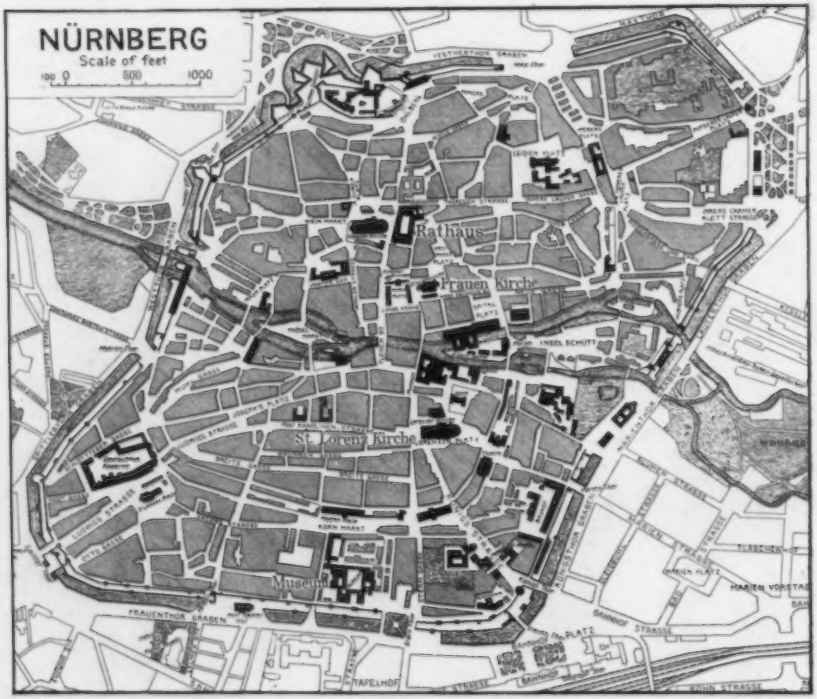

Fig. 9—Town map of Nürnberg. The city of Nürnberg retains to a remarkable degree the aspect of a medieval Bürgerstadt. (From "The Story of Nuremberg," by Cecil Headlam. Reproduced by courtesy of J. M. Dent & Sons, Ltd., London, and E. P. Dutton & Co., New York.)

A *hôtel de ville* of medieval, though not early medieval, date becomes characteristic, and either on it or over a gate in the city wall stands a *beffroi*. With increasing distance from the central power the bourgeois life expressed itself more sturdily, and the preoccupation of the princes with war helped the citizens to gain their rights, but the *beffroi* also betokens the approach to the historic war zone and the need of the citizens to gather for their own defense against invaders seeking to penetrate into the good lands of the basin.

As we proceed further the dates of social evolutionary processes grow later, religious and secular become increasingly differentiated, and guild

halls of the crafts appear; they are notable, for example, in Flemish and Walloon cities. One may also recall in passing the conflicts of bourgeois and bishops in Geneva and the triumph of the former expressed in the subsequent story of the city of Calvin and Rousseau.

The Germanic Cities

Needless to say, the variety of local circumstance and initiative led to much variation in the form of differentiation of social expression, and it

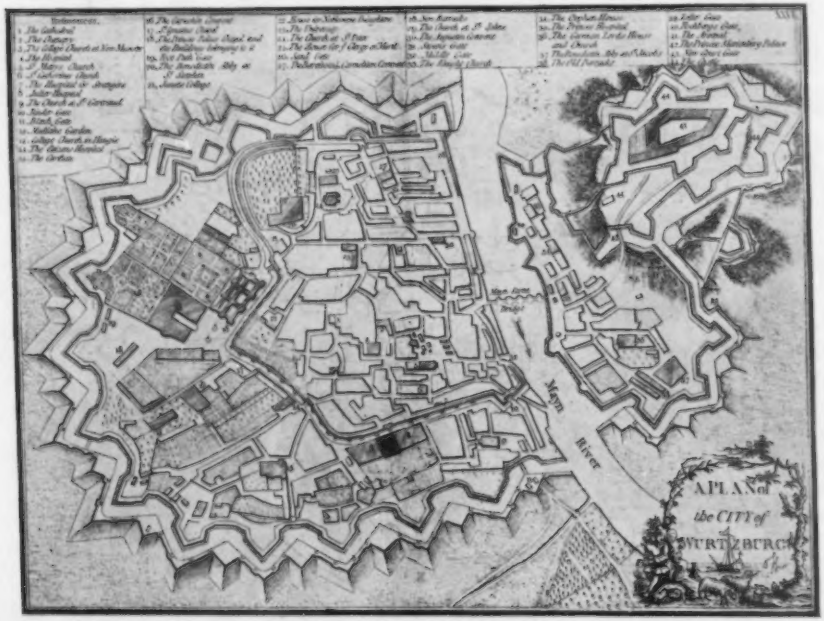

FIG. 10—Town plan of Würzburg. The Cathedral occupies a central location (1) but the whole city is dominated by the fortified castle of Marienberg on the left bank of the river (44). The University of Würzburg (23) still preserves much of the tradition of the medieval academic life. (From John Andrews: A collection of Plans of the most Capital Cities . . . . . London, 1772.

is rather more difficult to see detailed community of type in the cities of the more Germanic lands. The cathedral is less dominant, the castle on the whole more so. The guild houses of the crafts in many cases are very notable additional features. *Bürger Deutschtum* and *Junker Deutschtum* show their conflict in the country's town maps, and we have to take account of the fact that the architecture we call Gothic was a creation of the Paris Basin and penetrated into Germany under the influence of ruling classes rather than as a popular movement. This helps us to understand the lessening of church dominance in the town map and the rarity of good Gothic architecture in Germany.

A marked difference between South Germany and the Paris Basin arises from the fact that South Germany has no such dominant center as Paris and also from the fact that much more of the substance of educated thought is an importation through the agency of rulers and leaders. The University of Paris, with its romantic growth and its relation to the church and people, is unique. Other universities of the basin did not attain much strength, Paris dominating too directly. In South Germany the universities are numerous in ever so many of the sub-centers of that diversified region, and they sometimes dominate the city. They are all universities of the Paris type, i. e. groups of teachers with pupils gathered around them, not of the southern type which is fundamentally a student democracy. The physical diversification, again, in delaying political unification allowed to a far greater extent than in France the specialization of cities as fair centers with a large measure of independence, and these cities with their market places and their houses of merchant princes are a well-known feature. The cities of Ghent and Augsburg come to one's mind here.

FIG. 11—The Kremlin. "The Chiefs' Town" of Moscow contains the palaces of the rulers, the cathedral of the orthodox church, the court of justice, and the arsenal.

We must not, however, push our working hypothesis too far. Not all the features of a Germanic city are to be looked upon as derived by a process of importation from the Paris Basin accompanied by various types of differentiation. That hypothesis helps us in some measure, but we cannot live in Zurich, for example, without realizing that there are also products of the thought and tradition of the local inhabitants, both Alpine and Nordic. The cities of *Bürger Deutschtum* deserve our keen appreciation, even when their churches seem strange and cold in comparison with those of France. They are cities built for the citizens' life, and the seeking of private profit has not that unique prominence which makes modern English industrial cities, and some others too, such a sad commentary on western civilization. A striking feature is that many of the German cities in spite of their immense growth in the industrial and financial periods have still kept their old character. The city fathers were wise enough not to let the municipal lands get into private hands, and so the industrial growth has in many cases

been on public land, and the amenities of life have received some consideration. Slums do not seem inevitable, railways and docks have been placed with some regard to the public interest. Theater and concert hall are supported by the city and are able to provide opportunities for musical talent and for the citizens' healthful enjoyment that are often matter for

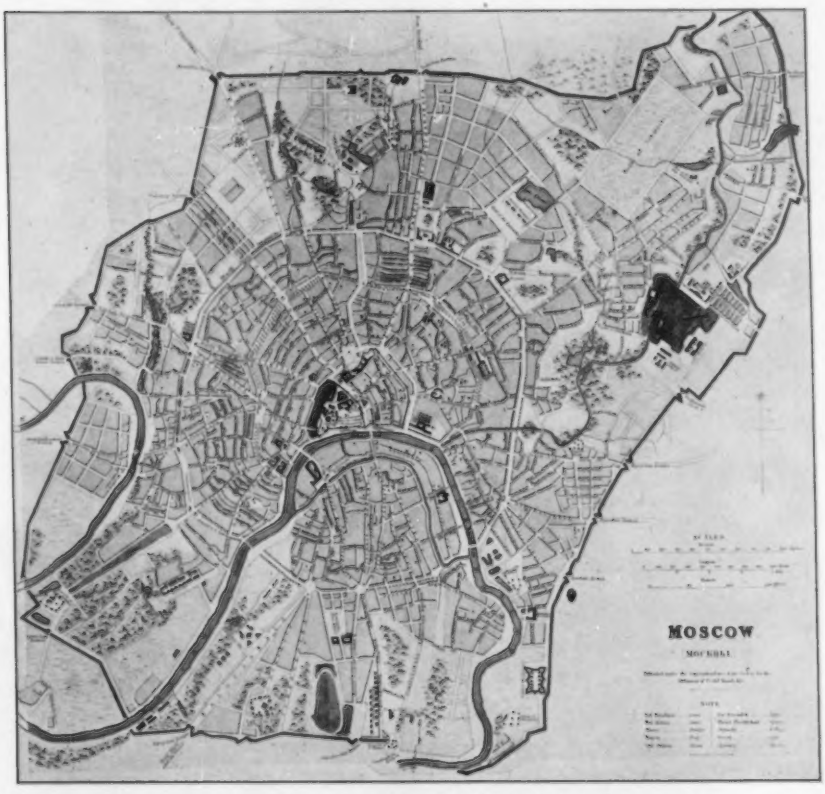

FIG. 12—Town map of Moscow, 1839. The plan clearly shows the distinction drawn between the rulers and the people. A broad open space for intercourse and exchange separates the Kremlin from the people's city. Compare view of Moscow, *Geogr. Rev.*, Vol. 1, 1916, p. 259.

envy. Governmental regulation in the past half-century seriously lessened the good derived from all this, but, if that source of danger is now really removed, the *Bürgerstadt* may once more become a great contributor to our common civilization.

CITIES OF EASTERN EUROPE

Further east the general type of city tends to change again. Importations from the west by rulers and leaders stand out still more distinctly.

At Prague, for example, on one side of the river we have the fortress, with the palace and the cathedral within it, standing out over against mercantile Prague on the other bank, with its *Rathhaus* and its *Tynkirche*. The *Junkerstadt* and the *Bürgerstadt* are distinct, though both are German to a considerable degree.

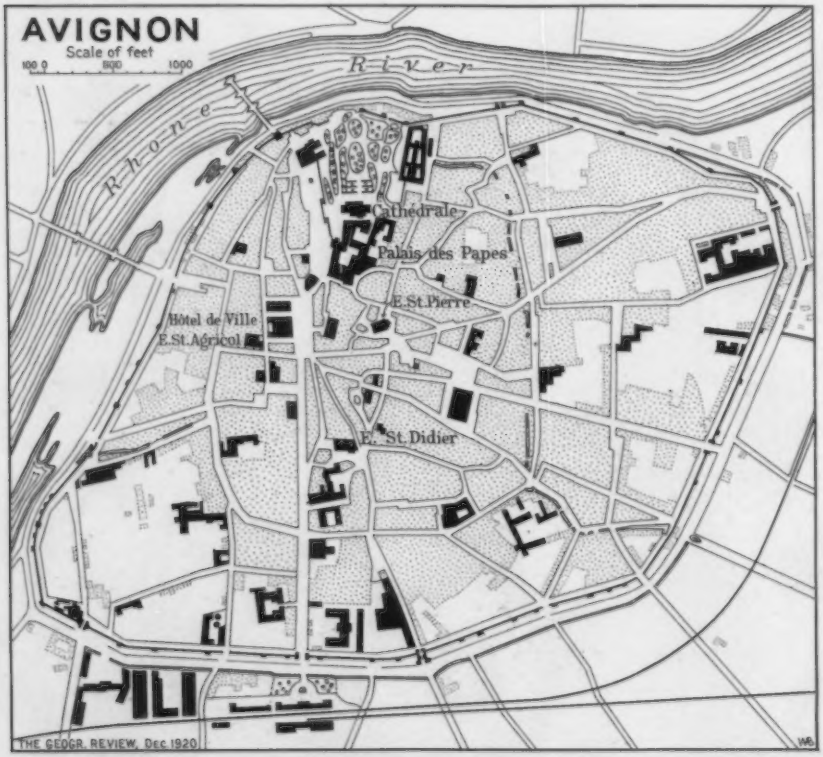

FIG. 13—Town map of Avignon. The Palace of the Popes (see Fig. 3), overlooking the town and its suburbs, marks the domination of a foreign power.

Eastward, again, the element of importation is still stronger and has become dominant. The Russian Slavs look upon themselves as colonists in clearings of the forest—colonists who have come from the Galician platform in the course of centuries. They are only semi-settled, and their share in the civic life is only a secondary one. The towns grew around the settlements of Varangian chiefs and Hanseatic traders with the help of religious permeation northward from Byzantium through Kiev. The center of the city, whether at Moscow or Novgorod, is the *kremlin*. It corresponds in a sense to the Hradschin at Prague, but here it occupies the heart of the city which radiates around it in every direction. Here, also,

we have no rival center with *Rathhaus* and *Tynkirche*. The Kremlin at Moscow includes three great cathedrals, eighteen other churches, and also palaces and fortifications. It is literally a chiefs' town; and outside its crenelated walls were planned open spaces for intercourse and exchange, and some churches and other buildings of the people's city have grown there. Beyond them the people's city radiates in all directions. At Moscow it is easy to see how the religious spirit of the Russian peasantry has sanc-

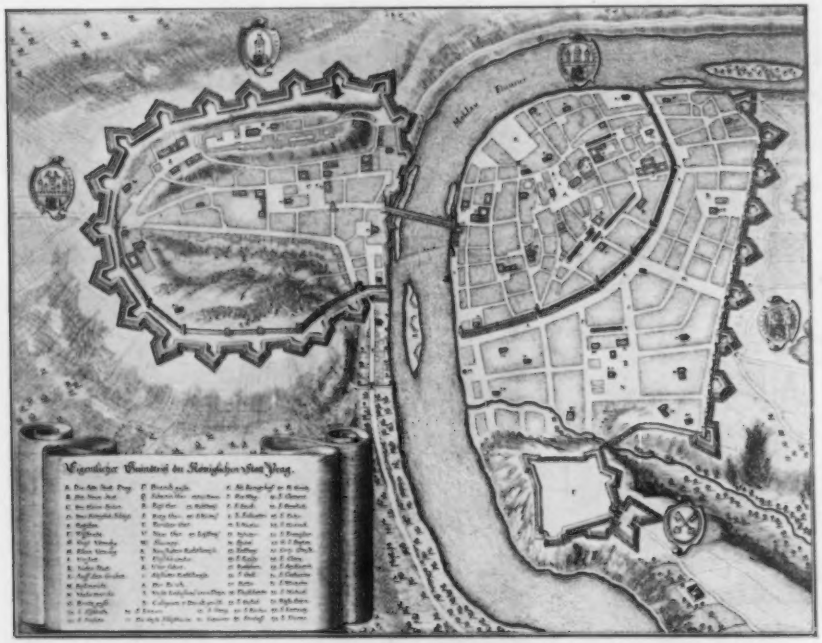

FIG. 14—Town plan of Prague. The Old Town and the New Town, on the right bank of the Moldau, form the mercantile center of the city, with its markets, (2, N and M), its town-halls, (1 and X), and the Jews' quarter (K). On the left bank stands the Hradschin, the fortified residence of the Bohemian kings, with its barracks and cathedral. (From Matthaeus Merian: Topographia Bohemiae, Moraviae et Silesiae, Frankfurt, 1650.)

tified the commonplace by building the innumerable churches of the Mother City, but at its center is the strange combination of Varangian and Byzantine with who knows what strange touches of the mystery of the East.

AVIGNON COMPARED WITH MOSCOW

One famous French city presents the most interesting analogies to Moscow. It is Avignon, the city of the popes. Avignon has its southern market place and its scores of other characteristics of an ordinary city of the south, but it is completely dominated by the grim palace of the popes, and within the *enceinte* of that palace the cathedral also finds its place. Outside its

ramparts is an open space marking off this monument of a temporary foreign domination from the rest of the city. In other words, there is the brusque juxtaposition of foreign and indigenous organizations in Avignon somewhat as there is in Moscow. No one who knows France will need to be told how Avignon stands apart from other French cities in character.

Summary

The surface of temperate Europe, from the shores of the North Sea and the English Channel on the west to the southern part of the Urals on the east, was covered by deciduous forest before man cleared it. The summer

Fig. 15—The Castle and Cathedral of Cracow. (Photograph copyright by Brown Brothers, New York.)

westerlies bring rain that keeps this vegetation healthy, and the soil is warm enough to allow the roots to act freely and draw up the abundant moisture given off by the spreading leaves. The leaves are dropped as the winter cold sets in. The régime which favors the deciduous forest also favors, or at least permits, corn cultivation. Permanent settlement is possible where the growth of one season of the year provides the main part of the food for the twelve months. To the north, where the soil is colder and the roots may not work so freely, only the pines, much more economical in their demands for water, can grow. The soil of the pine forest yields very meager return to the cultivator, and so the belt of the deciduous forest is, broadly, the northern belt of cultivation in Europe.

The Paris Basin was the first of the regions of the deciduous forest to be extensively cleared, and in the post-Roman centuries forest clearing was proceeding here and spreading eastwards generation by generation. It affected many parts of Germany in the seventh to the ninth centuries and continued later in Bohemia and Poland and later still in Russia, where the forest is of oak without the more exacting beech for a companion. Forest clearing led to improved conditions for settled life, and settlement became

well defined in the Paris Basin while as yet the Germanic lands were in the wild. The progress of settled life eastwards has been a most noteworthy feature of European history and of late has been affecting Russia in an increasing measure with corresponding increase of difficulties in the matter of land ownership.

Settlements were at first largely rural. Cultivators of wheat sought supplies of salt as an accompaniment of a cereal diet and necessarily of a winter diet that included pork. Urban centers grew up in course of time as a necessary consequence. Just as in earlier efforts so here the Paris Basin led, and the cities of that basin mark the blossoming of settled life after the centuries of post-Roman movements. On the whole, city development becomes later as we go eastwards. Again Prague and Warsaw in the center of riverine regions are younger than Domazlice and Cracow in the gates of the hills. Both Prague and Warsaw are known to have been founded in forest clearings and to have replaced the older cities in leadership of their respective regions.

With extension of settled life and urban life went the eastward extension of the Roman Church in its medieval form, heralded by St. Augustine's famous discussion of the City of God. The chain of thought he encouraged contributed its quota to the character of the city as it arose in the early Middle Ages in the Paris Basin with the cathedral as in a large measure a synthesis of its common life. But time brings definition, and definition brings differentiation of function with the inevitable consequence of differentiation of structure. So we get *hôtel de ville* or *Rathhaus* side by side with the cathedral on the eastward and northeastward road, and guild halls of the crafts show us a further stage of the process. Moreover, the multitude of smaller and more local causes included under the name of chance make the differentiation take divers forms in divers cities of the Germanic lands. Add to this also the undoubted direct influence of the *genius loci*.

Thence we pass on to the regions where western ways were introduced by the leading classes, and with this we find the differentiation of a leader city with palace and cathedral within its ramparts. Naturally we find this especially after crossing the formidable language barrier between the western tongues and the eastern Slavonic ones. At the same time other factors, factors arising from the life and thoughts of the native population, affect the more easterly cities; and nowhere are they more evident than in Moscow consecrated by the gift of generations of Russian pilgrims to its ever increasing number of shrines.

Finally we may notice the cities of the steppe border in Russia founded as the authority of settled life and its form of government spread and pushed the nomadic life back again towards the east during the recent comparatively wet climatic phase. They were founded where land was abundant by ambitious leaders commanding considerable experience and resources. They show the rectangular plan typical of civilized effort not only in modern Russia and the New World but also in the ancient Mediterranean region

and Mesopotamia and apparently the ancient Orient as well. Abundance of land has meant over wide streets in Russia, just as costliness of privately owned land has meant disastrous overcrowding in industrial cities in England and elsewhere. To trace the extension of civic expression from France to Britain would be at least as interesting as to trace it eastward through the deciduous forest but other factors have been at work with their modifying effect.

The study of the city map, we may now conclude, stimulates many thoughts about the progress of humanity, about that complex interweaving of environmental influence and cumulative human effort through the centuries which it is a special function of the geographer to try to interpret.

THE BLACK BELT OF ALABAMA

By HERDMAN F. CLELAND
Williams College

To speak of the "Old South" is at once to suggest a very definite type of civilization. There has been no more distinctive human product of American soil than the culture of the "Cotton Kingdom" of *ante bellum* days. Two generations from the declaration of democratic faith saw flourishing a caste system, rooted in the institution of slavery of which the spread was largely conditioned by geographic factors—the fertile soils and warm temperate climate of the South.[1]

It was a short-lived civilization this, with its social ideals expressed in the ownership of "a mansion, a cotton plantation, and a hundred slaves,"[2] but its relics still remain. If one would see them before they are swept away by the hand of progress let him for choice go to Alabama and in Alabama to the Black Belt. Ask almost any Alabaman where the best *ante bellum* architecture of the state is to be found and the answer will surely be, "In the Black Belt." Ask in what part of the State the people are most cultured and most highly educated; where the traditions and prejudices of the Old South are strongest, and it will be, "In the Black Belt." Ask for a town typical of the Old South, and Greensboro will frequently be mentioned; and unspoiled, Greensboro is well worth a visit.

A TYPICAL BLACK BELT TOWN

A brief description of this town of about 2,000 inhabitants, of which the greater portion are negroes, will serve as a starting place from which to discuss the geographic influences which shaped the civilization of this interesting region. Moreover, Greensboro is especially favorable for such a study because, like most towns of the Black Belt, it is not situated on a waterway, and the complex factors which arise from such a situation are lacking.

THE "MANSION" OF THE COTTON PLANTER

About a mile from the railroad station at a turn in the road is seen the first "mansion" or "big house," as the negroes term the home of the landowner, whether it be large or small. It is almost hidden by a tangle of vines and shrubbery and by the great trees which shade it. A more perfect setting for the most romantic stories of Thomas Nelson Page would be hard

[1] F. V. Emerson: Geographic Influences in American Slavery, *Bull. Amer. Geogr. Soc.*, Vol. 43, 1911, pp. 13–26, 106–118, 170–181.

[2] W. E. Dodd: The Cotton Kingdom; A Chronicle of the Old South (*The Chronicles of America Series*, Vol. 27), Yale Univ. Press, New Haven, 1919.

to find. The dignified simplicity of the tall Ionic columns that support the pediment to form the porch, the nearly perfect proportions of the house gleaming among the green of the great oaks give an impression of culture and romance.

Further on down the street other *ante bellum* houses are seen, all in spacious grounds, but most of them surrounded by unkept lawns and decrepit fences. No two houses are alike; each has its own individuality, and most of them have great charm. In all of them the columns are two stories high; but some are square, some round and smooth, some round and fluted, some hexagonal, some thick, and some slender. All the houses have either a gallery running their full width or a balcony over the front door. Some, however, are not of the colonial type but show the influence of the French architecture so characteristic of old New Orleans. As a rule, a wide hall, with a high ceiling, extends through each house on each side of which are two rooms 20 by 20 feet. In *ante bellum* times the kitchen was entirely separate from the main building; but this custom was abandoned after the freeing of the slaves, and the kitchens are now attached to the houses.

In construction and appurtenances the mansion is typical of the civilization that produced it. In a town of the Black Belt not far from Greensboro is a house perhaps as large and fine as any in this town—a house which cost the owner, according to his boast, not more than $450. The bricks for the foundation and fireplaces were made and laid by his own slaves; the lumber came from the trees of his own woodland and was cut and sawn by his slaves; and the house was built by negro carpenters who belonged to him. Only the window glass and hardware, which his blacks could not make, were purchased. It is difficult to estimate the cost of the *ante bellum* houses, which were built largely by slave labor, because of the great variation in the cost of interior decorations. From the data available it seems probable that a house worth $25,000, if built by contract in 1914, probably cost about $3,000 or $4,000 under *ante bellum* conditions.

The Poorer Quarters and Negro Cabins

There is an erroneous impression in the North, and in the South for that matter, that most of the white population of the South before the Civil War were slave owners, whereas the truth is that only about 40 per cent of the families owned slaves. The poor of the white population did not own slaves, and their houses were as cheap and unsightly as those of people in similar circumstances today. Consequently any one who visits Greensboro expecting to find a street lined with stately dwellings will be greatly disappointed, for there are more unattractive than attractive houses. Nevertheless the proportion of old dignified houses is sufficiently large to make the streets unusually interesting, and is greater perhaps than in any other town in the South. The fact that the "mansions" were surrounded by extensive grounds should not be forgotten if a true conception of a Black

FIG. 1

FIG. 2

FIG. 1—This mansion was built in 1852 by the owner of a plantation of 1,500 acres. The house is no longer in possession of his descendants although they retain the land.

FIG. 2—A number of Black Belt mansions show the influence of the French architecture so characteristic of the older houses of New Orleans. This house was built in 1843 by the owner of a plantation of 1,800 acres.

Belt town is to be gained. The following figures, taken at random, are the areas of the plots of ground surrounding the planters' homes in Greensboro: 140, 60, 30, 6, and 5 acres.

The black servants of the planters lived either in a restricted section of the town or in cabins scattered here and there over the plantations. These cabins are nearly all alike, containing one or two rooms and having a brick, or stick-and-mud, chimney built on the outside. In the country districts one sees many negro cabins and occasionally an overseer's house but seldom the home of a planter. Indeed the picture that comes to one's mind after

FIG. 3—The picture one carries away after traveling over the Black Belt is that of a gently rolling prairie with negro cabins standing in open fields. (Photograph by R. M. Harper.)

traveling over the Black Belt is that of a fertile, gently rolling prairie with negro cabins standing in the open fields and not even a tree or shrub to furnish shade or add a touch of beauty.

MAIN STREET AND THE OLD MARKET

There is little to be said about the business street of Greensboro. It is no better and no worse than the "main street" of the average American village or town. However, it is of interest to the Northerner on a Saturday when the negroes come to town to do their trading and as compared with the whites number perhaps 25 to one. Although most of the buildings have been erected since the close of the Civil War, the street was probably even less inspiring in "the old time" than now. There is one building, however, that gives it a flavor of the Old South. It is the old market, and, although now used for other purposes and standing in a back yard, it assists one to

reconstruct the life of sixty or seventy years ago. It is doubtful, though, if this market was ever an important institution in the life or economy of the village in *ante bellum* days, as most of the plantations were nearly self-supporting.

The presence of the college on the edge of the village tells much of the ambitions and aspirations of the settlement. College and mansion, overseer's home and negro cabin give a picture that is typical. Let us now extend our view over the Black Belt as a whole.

FIG. 4—The "main street" of Greensboro. On Saturdays the negroes come to town in large numbers to do their trading and at least 25 negroes will be met on the street to one white person. The automobile has not entirely replaced the mule-drawn vehicle.

WHAT IS THE BLACK BELT?

The Black Belt, also called "Black Prairie" and "Canebrake" and "Cotton Belt," is not so named because of the large number of negroes, although it happens that the proportion of negroes to whites is 78 to 22, the highest in the state, but because of the dark color of the soil which is in striking contrast to the red and yellow soils of most of the state. This strip of rich, black soil has an average width of 20–25 miles and an area in the state of about 4,300 square miles and extends in an east-west direction nearly across south central Alabama. It conforms almost exactly with the easily decomposed, impure, chalky, Cretaceous limestone (Selma chalk) which has a thickness of about 1,000 feet in the western part of the state and disappears in the east, near Montgomery. This formation dips to the south at the rate of 30–40 feet to the mile while the surface slopes at a much less rapid rate in the same direction.[3] The weathering of the beveled edges of this

[3] E. A. Smith: The Underground Water Resources of Alabama, *Geol. Survey of Alabama*, Montgomery, 1907.

"rotten limestone" determined the width and position of the Black Belt; and the soil formed from it is a clay of exceptional fertility but somewhat difficult to work because it bakes in summer and becomes tenacious mud in winter.

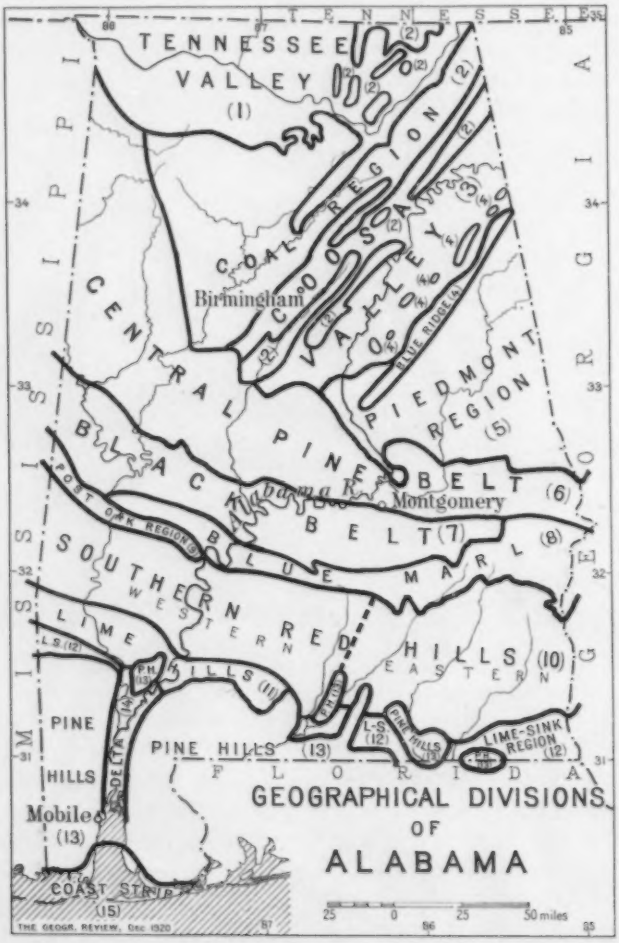

FIG. 5—Geographical Divisions of Alabama after R. M. Harper. Harper's geographical divisions are given in the maps accompanying Geological Survey of Alabama Monograph 8 (Geographical Report on Forests), 1913, and Special Report No. 11 (Resources of Southern Alabama), 1920.

PHYSIOGRAPHY OF THE BLACK BELT

Physiographically the Black Belt is a trough-shaped depression with a gently undulating surface parts of which, "mostly remote from the rivers, are so level that the railroads have built several tangents (i. e. straight

tracks) a dozen miles or more in length."[4] In the whole region, with the exception of the river bottoms, swamps are rare, notwithstanding the clay soil.

An early writer characterized it thus: "In the uncleared parts of the canebrake one can scarcely satisfy himself that he is not standing on the low grounds of a river; the deep, alluvial-looking soil beneath his feet, the moisture-loving long moss (*Tillandsia usneoides*) above his head, together with an undergrowth of *Sabals*, *Palmettoes*, and other natives of damp soils, strengthen the illusion."[5]

As one rides over the gently rolling surface of this region and crosses the steep-banked gullies and the bluff-bordered rivers one is impressed with the

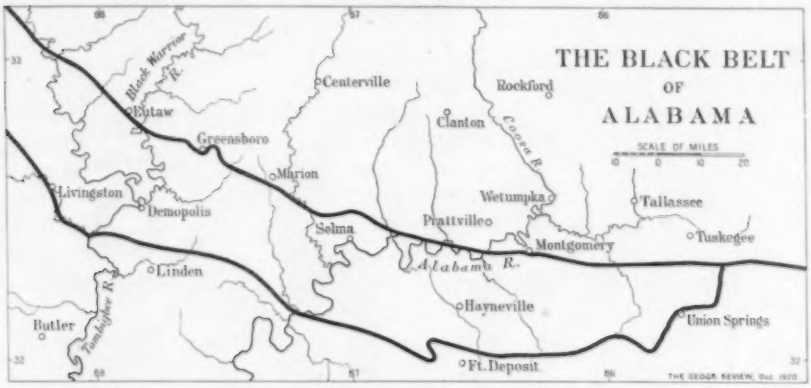

FIG. 6—Location map of the Black Belt.

aspect of topographic youth. However, a more careful study forces one to the conclusion that the region is not only not in the youthful stage of a first cycle of erosion but that the surface is a recently raised (Pleistocene) peneplain whose thick residual soil has not yet disappeared and in which the rejuvenated streams have sunk their beds in places 60 or more feet below the surface of the plain.

EARLY HISTORY

The topography, soil, and climate of the Black Belt offered unique opportunities for settlement. In the second decade of last century the cession of Indian lands opened up large areas of Alabama to the westward movement. Pickett, the historian of Alabama, picturesquely describes the movement thus:

The floodgates of Virginia, the two Carolinas, Tennessee, Kentucky, and Georgia were now hoisted, and mighty streams of emigration poured through them, spreading over the

[4] R. M. Harper: Economic Botany of Alabama, Part I, Geographical Report, *Geol. Survey of Alabama Monograph 8*, University, 1913, p. 85.

[5] Michael Tuomey: First Biennial Report on the Geology of Alabama, Tuscaloosa, 1850, p. 136.

whole territory of Alabama. The ax resounded from side to side, and from corner to corner. The stately and magnificent forests fell. Log cabins sprang, as if by magic, into sight. Never, before or since, has a country been so rapidly peopled.[6]

In the case of the Black Belt, however, when first occupied possibly 10 per cent of the surface was treeless so that the early settlers were immediately able to raise an abundant harvest on the rich, virgin soil.

The first mail was brought to Greensboro in 1818, only forty-three years before the opening of hostilities between the North and South, but so rich was the soil and so profitable the slave labor that thirty years after this date the land had been cleared of its timber and the pioneer log cabins largely replaced by the fascinating homes of the southern planter. In fact, one of the finest *ante bellum* houses was built in 1843, only twenty-five years after the settlement of the region, and near Demopolis the famous Gainswood mansion was built only fifteen years after its settlement.

The land of the Black Belt was acquired under homestead acts and by purchase in connection with these acts. A settler was allowed to "homestead" 160, 320, and 640 acres according to the changing laws of the period. Title to practically all of the land was acquired between 1819 and 1839, and, as during this period the law permitted a person to buy large tracts in addition to his homestead at prices ranging from 25 to 30 cents an acre, (though it is reported that some of the land was sold by the General Land Office at public sales for as much as $50.00 per acre), many wealthy persons availed themselves of the privilege and purchased hundreds of acres. One plantation contained 11,000 acres and very few less than 1,000 acres.

The Plantations

Most of the planters of the Black Belt lived in towns—several of them situated on the northern or southern edge of the belt—and there built their "big houses" or "mansions." The term "planter" was in common use, and the men who graduated from the University of Alabama before the Civil War and who engaged in agriculture are invariably designated as planters in the alumni catalogue of that University. Because of the extent of the estates it is not surprising to find that some of them were ten, fifteen, and even thirty miles from the planter's home. To reach his plantation the planter was obliged to travel on horseback during the greater part of the year because of the condition of the roads, which when wet were "converted into a mass of clay sufficiently soft to allow his wheels to drop down to the axle, but having a tenacity that no clay ever had."[7]

The number of slaves owned by seven Greensboro planters about whom information was obtained was, on the average, one slave for every ten acres; for example a planter owning 4,000 acres would have 400 slaves. If the negro

[6] A. J. Pickett: History of Alabama, and Incidentally of Georgia and Mississippi, from the Earliest Period. 2 vols., Charleston, 1851; reference in Vol. 2, p. 385.

[7] Tuomey, *loc. cit.*

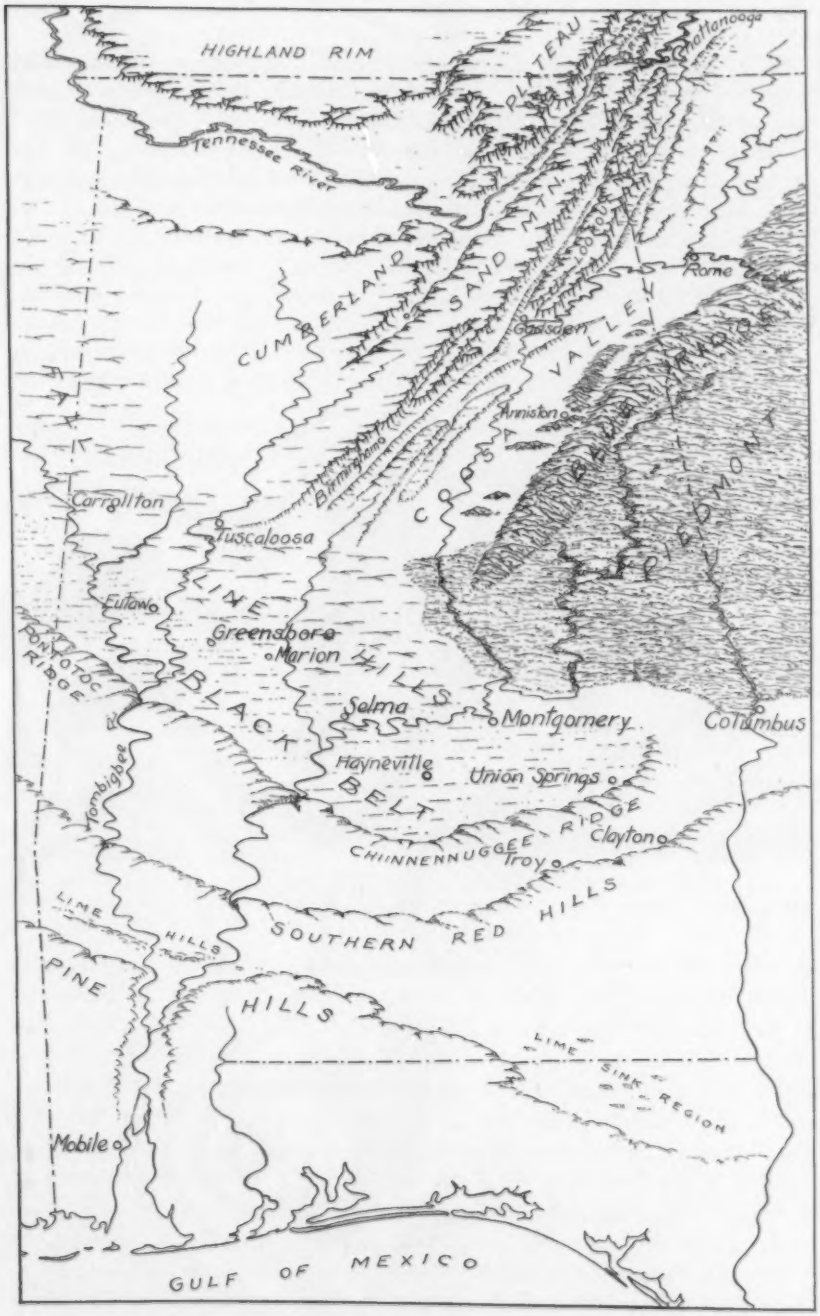

FIG. 7—Diagram presenting a bird's-eye view of the state of Alabama. (Diagram by A. K. Lobeck.)

family had, on the average, six children the man of the family would at this rate care for about 80 acres. Such information is, however, very untrustworthy because of the tendency on the part of the descendants of a family to give the maximum rather than the average number of slaves. The estimate that on a plantation of 2,000 acres there were, on an average, about 75 slaves including men, women, and children seems most probable. Very few planters in the South ever owned as many as 500 slaves.

Social Relations and Culture

One indirect effect of the physical conditions which resulted from the ownership of large plantations was the development of a self-respecting

Fig. 8—A typical Black Belt landscape. The white patches are chalk from which the black soil has been eroded. Sumter County. (Photograph by R. M. Harper.)

landed aristocracy which, because of the large size of the estates, was relatively small. It is on this account that the knowledge of family history possessed by the older generations of the people of this region is almost uncanny. Mention the name of an old Alabaman family, and doubtless almost any of the older inhabitants can tell you not only a great deal about the family characteristics and history but also who are their "kin" by marriage, even though they had never met a member of the family.

There is an all too prevalent but unfounded belief that the presence of an inferior race in large numbers lowers the standard of the dominant race. In the Black Belt where the proportion of negroes to whites is larger than in any other part of the United States (except the black counties of the Mississippi River bottoms) and where the average wealth of the landowners is relatively high, the white people have maintained high standards

of education and culture. Illiteracy among the whites amounts only to about 2 per cent; that of the negroes is about 44 per cent.[8]

Cultural development of *ante bellum* days was the same as it is the world over where rich lands have yielded wealth and the leisure that promotes a high state of civilization. Bliss Perry has expressed it by saying that with few exceptions the best literature of the world has been the work of men whose energy was not dissipated by poverty. The southern planter was patron and cultivator of the arts. The estate to which he believed himself called demanded the equipment of an education and this of the old-fashioned classical kind. The little college of Greensboro was one of many similar local institutions in the south founded by the planters in their desire for culture and learning at a time when travel was difficult, when roads were

FIG. 9—The foreground shows the level surface developed in parts of the Black Belt. In the background is seen oak woodland also characteristic of the region. (Photograph by R. M. Harper.)

even worse, if possible, than they are now, and there were no railroads. In this connection it should be noted that the Black Belt was settled almost exclusively by people from Virginia and the Carolinas, many of whom were from families of wealth and education.

N. S. Shaler, in discussing the culture of central Kentucky where somewhat similar conditions prevailed, says:

> The settlers were prosperous, the burthen of life was light, the climate admirable, so that they were ideally placed for further and high development in the intellectual field. . . . The failure of the Kentucky people to make good their promise . . . is in my opinion to be accounted for by a peculiar combination of circumstances, of which the Civil War was the most potent.[9]

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[8] R. M. Harper in the *Montgomery Advertiser*, June 1, 1919. See also the note on the "Southern red hills of Alabama" in this number of the *Review*, p. 413.

[9] The Autobiography of Nathaniel Southgate Shaler, Boston, 1909, p. 76.

The same may be said of the Black Belt. If the slaves had not been freed so soon after the settlement of the Black Belt and if so many of the intellectual leaders had not been killed in the Civil War, it might have become, in the course of time, a center for literature and art.

"The Lost Cause"

The loyalty for the "Lost Cause," which lingered so long in the Black Belt, was the outgrowth, directly and indirectly, of geographic influences. The

Fig. 10—This mansion was built in 1840, in Greensboro, twenty-two years after the first mail was brought to the region. On a hill about two miles from the town stands the overseer's house, a structure which would have been called a "mansion" had it been occupied by the owner.

most important factors were the lack of natural resources other than soil, such as coal, iron, and water power, and indirectly the negro population. Because of these conditions there was little to attract immigrants; and, as the people were impoverished by the war, they were unable to travel. The consequence was that the deep convictions which their environment engendered were long retained. These convictions were strengthened by the inexcusable policy of Reconstruction times when the organization of the Ku Klux Klan was made necessary in order that the rights of decent people might be safeguarded. It is also probable that not a little of the bitterness toward the North resulted from the poverty in which the people of the South found themselves after the War. According to the historian of Greensboro,[10] it was not until the year 1884 that there was a semblance of building in that town.

[10] W. E. W. Yerby: History of Greensboro, Alabama, from Its Earliest Settlement, Montgomery, 1908, p. 119.

Loyalty to the Union has come since then. For thirty-three years after the close of the Civil War no United States flag was unfurled in Greensboro; but in 1898 when the news of the destruction of the Spanish fleet by our navy at Manila reached the United States the feeling of pride broke the restraint of a third of a century, and the Stars and Stripes again floated to the breeze to celebrate the victory. The Spanish American War, the election to the presidency of Woodrow Wilson, a man born south of the Mason and Dixon line, the great World War, and the passing away of many of those who fought and suffered in the Civil War, have combined to make of the people of the Black Belt loyal defenders of the country, though always retaining an affection for the Stars and Bars.

Recent Changes in the Black Belt

Many things have conspired to leave Greensboro nearly untouched by change. Even the railroad is a branch line and is about a mile from the town. There are no factories to attract foreigners or laborers from other states, and few outside influences have affected its placid life since the Civil War. But now after its sleep of fifty years this Old South town is rapidly losing its isolation, and the same is true of many other towns of the region. Roads are being rapidly improved, and the omnipresent automobile is doing its share in the awakening.

Upon the death of the old planters the land is divided among their heirs or is sold, and the great estates are disappearing. Already one sees by the roadside advertisements offering sixty-acre farms for sale, and much land has been purchased in the past ten years by people from the Middle West. Before another fifty years shall have passed the land of the Black Belt will probably have been broken up into many small farms, few or none of the princely *ante bellum* estates of hundreds of acres will remain, and most of the old "mansions" will have passed into the hands of strangers. One sometimes wishes that the English law of primogeniture were in force in this country so that these estates might be handed down intact to the first-born from generation to generation. But perhaps it is better that the new order replace the old, since a greater number of people are benefited by the breaking up of the great plantations. This will result in a greater density of population, greater wealth, better roads, and less illiteracy among the negroes.

The saddle horse of the planter has already been largely supplanted by the automobile; the old families are gradually disappearing from the towns; and in a few years the descendants of those who made the romantic civilization of the Old South will be few. The record of the past will soon be found only in courthouse documents, on the gravestones of the ill-kept cemeteries, and in material form in such *ante bellum* homes as shall have escaped the ravages of fire and decay.

ARRIVAL AND DEPARTURE OF WINTER CONDITIONS IN THE MACKENZIE RIVER BASIN*

By E. M. KINDLE
Geological Survey of Canada

The life of the few white inhabitants of the Mackenzie Valley north of Lake Athabaska is intimately bound up with the waterways of the great river system. Interest still centers almost exclusively in fur trading. The annual export of furs from the basin as a whole is said to amount to some $2,000,000. Its transportation is dependent on the rivers. The railway ends near McMurray: from that point to the Arctic coast steamer navigation on the Mackenzie is interrupted at but one point, the rapids at Fort Smith. Two lines of steamers have for a number of years been engaged every summer in bringing out the winter catch of fur and taking in the yearly consignment of supplies to the trading ports which are located from 100 to 200 miles apart throughout the Mackenzie River system.[1]

During the winter season the only communication between the Mackenzie Valley and the outside world is maintained by dog sledges or carioles (Fig. 2) which carry the mails in and out of the Mackenzie Valley once a month. Only first-class mail, however, is carried on these.

It may well be understood that to the inhabitants the great seasonal events of the year are the opening and closing of navigation on the waterways of the basin. These are also events of interest to the geologist and geographer.

The appearance and disappearance of winter ice in the Mackenzie Valley mark the limits of the seasonal period during which the processes of erosion are active over about one quarter of the continent. As will subsequently be shown, this period is relatively short in Northwestern Canada as compared with more southerly latitudes, a circumstance which must result in a correspondingly slow degradation of the land surface.

WINTER CONDITIONS

The character of the winter temperature in Northwestern Canada is indicated in Table I, which shows the minimum temperatures (in degrees Fahrenheit) recorded in each of the winter months, 1915–1916 to 1918–1919 inclusive, at Fort Simpson, Hay River, and Edmonton.

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* Published with the permission of the Director of the Geological Survey of Canada.

During two field seasons spent in the Mackenzie Valley the writer has had an opportunity to note the dates and some of the features incident to the opening and closing of navigation on the Mackenzie and its larger tributaries. On each of his trips to the Mackenzie, Great Slave Lake was entered as early as the ice would permit. The journey out in 1919 was completed after many streams and small lakes had been closed by ice.

[1] See E. J. Alcock: Past and Present Trade Routes to the Canadian Northwest, *Geogr. Rev.*, Vol. 10, 1920, pp. 57–83.

Probably no better authority for the character of the winter climate of the lower Mackenzie Valley can be cited than R. MacFarlane, who spent many years in the region. He wrote as follows of the winter conditions at Good Hope:

During the months of January and February, 1863, the thermometer was frequently as low as 50° and 60° below zero of Fahr.; it was also several times down to 65° and 66°, and once actually at 70°! Notwithstanding this fearful cold, we trip all the same. [See Fig. 2.] I was travelling myself, accompanied by six loaded sleds, on the voyage from Good Hope, during this severe cold. Last winter, however, was by no means so severe; the thermometer was comparatively seldom at 50°; it was once only at 55°, and once also 60° minus. In summer it is exceedingly hot at times.[2]

TABLE I—MINIMUM TEMPERATURES IN NORTHWESTERN CANADA[3]

STATION	SEASON	MONTH					
		Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Fort Simpson (lat. 61° 50′ N.)	1915–16	—19	—39	—45	—48	—44	— 7
	1916–17	—14	—48	—55	—62	—31	—18
	1917–18	—21	—57	—54	—45	—34	—24
	1918–19	—20	—24	—48	—55	—44	— 6
Hay River (lat. 60° 50′ N.)	1915–16	—18	—37	—51	—44	—45	— 8
	1916–17	—17	—40	—55	—55	—43	—24
	1917–18	—20	—60	—58	—50	—42	—24
	1918–19	—20	—34	—38	—56	—52	
Edmonton (lat. 53° 33 ′N.)	1915–16	— 3	— 6	—45	—37	—20	—17
	1916–17	— 8	—37	—44	—50	— 8	— 7
	1917–18	—13	—42	—43	—33	—28	— 2
	1918–19	— 3	— 0	—15	—37	—32	—22

It is evident that in a region of great lakes and great rivers, where nearly every winter shows a lowest temperature of 50° F. or more below zero, a vast quantity of ice must prevent erosion and navigation for a long period.

THE SPRING BREAK-UP

The break-up of the ice in spring begins in the small streams. Joseph Keele, who spent a winter in the Mackenzie Mountains, describes it thus:

In spring, the small side streams are the first to open, then the pressure from the increase of water in the main streams arches the ice sheet and finally breaks it up. The broken ice usually jams at some point lower down, the pent-up water behind the jam breaks out again and sweeps the river clear of ice. This operation is repeated until the entire river is open, no ice being left at the margins.[4]

[2] R. MacFarlane: An Account of the Mackenzie River District, *Proc. Royal Geogr. Soc.*, Vol. 9, 1864–65, pp. 125–131; reference on pp. 129–130.

[3] Furnished to the writer by the Canadian Weather Bureau.

[4] Joseph Keefe: A Reconnaissance Across the Mackenzie Mountains on the Pelly, Ross, and Gravel Rivers, Yukon and North-West Territories, Geol. Survey Branch, Dept. of Mines Ottawa, 1910, p. 20.

The formation of ice jams often leads to rapid and destructive rises in the northern rivers. At the mouth of the Clearwater River a rise of about 30 feet, which was caused by an ice jam in the spring of 1919, resulted in the loss of a large quantity of provisions stored at McMurray. Alfred H. Harrison described the break-up as he observed it on the Slave River as follows:

> The breaking up of the ice on these rivers is a grand sight. In the spring of that same year I happened to be encamped about two miles above a bend in the Slave River: in this bend the ice, which had broken in mid-stream, got jammed, and during that night the water, in three hours, rose 14 feet. Sometimes, indeed, the ice gets piled 20 feet high in places and seems to be solidly blocked right down to the bottom of the river; for as the ponderous fragments come along, they are drawn in underneath the pack, and it is only when the water has risen in this manner that the stream at length finds outlet and rushes away with a terrific roar, sweeping away the vast wreckage in its onset; and therewith the ice has wholly passed away for the season, saving only some isolated masses that emerge many days afterwards, covered with mud, from the river bed into which they have been driven by the enormous pressure from above.[5]

A photograph[6] taken by the writer shows a remnant of one of these ice jams on the bank of the Mackenzie which had a thickness of 25 feet in the last days of July.

The ice of Great Slave Lake blocks the navigation of the Mackenzie River for nearly a month after the great river is free of ice (Figs. 3 and 4). Owing to this fact navigation on the Mackenzie is limited to about three and one-half months. The record of the ice break-up at Rae on Great Slave Lake entered in the Hudson's Bay Company journals and published by Russell[7] shows the break-up during 6 years (1857–1859 and 1883–1885) to have ranged from May 30 to June 23. The general direction of the wind in spring, however, drives the ice toward the southern shore so that steamers seldom venture into the lake before the first of July. The photograph (Fig. 4) shows the character of the Great Slave Lake ice encountered by the writer late in June, 1917. Ice floes were present on the southern shore of the lake up to June 30 in 1917. In 1919 the writer passed through Great Slave Lake the last week in June without seeing any ice. Mr. Vail of Hay River reported that the ice disappeared in 1919 about June 15, an unusually early date.

The Mackenzie at Simpson, which is near latitude 62°, opens from May 4 to May 20, averaging from the 10th to the 15th, according to Captain Mills, who has spent several years at Simpson and has run steamers on all of the navigable waters of the Mackenzie basin. Because of nearly dead water in the Mackenzie for a long distance, the head of the river opens two and a half or three weeks later than at Simpson. The opening of Great Slave Lake generally occurs, according to Captain Mills, between June 16 and July 2, or six weeks later than the Mackenzie below Simpson.

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[5] A. H. Harrison: In Search of a Polar Continent, 1905-1907, London, 1908, pp. 17–18.

[6] E. M. Kindle: Notes on Sedimentation in the Mackenzie River Basin, *Journ. of Geol.*, Vol. 26, 1918, pp. 341–360; reference on p. 355.

[7] Frank Russell: Explorations in the Far North, Univ. of Iowa, Iowa City, 1898, p. 86.

McConnell states that the Liard ice broke into the Mackenzie May 13 in 1888. This is nearly six weeks before the ice in Great Slave Lake will permit steamers to reach the Mackenzie. The Liard, which is the largest tributary of the Mackenzie, breaks up before the Mackenzie and opens that stream below its mouth while the upper part of the Mackenzie is still

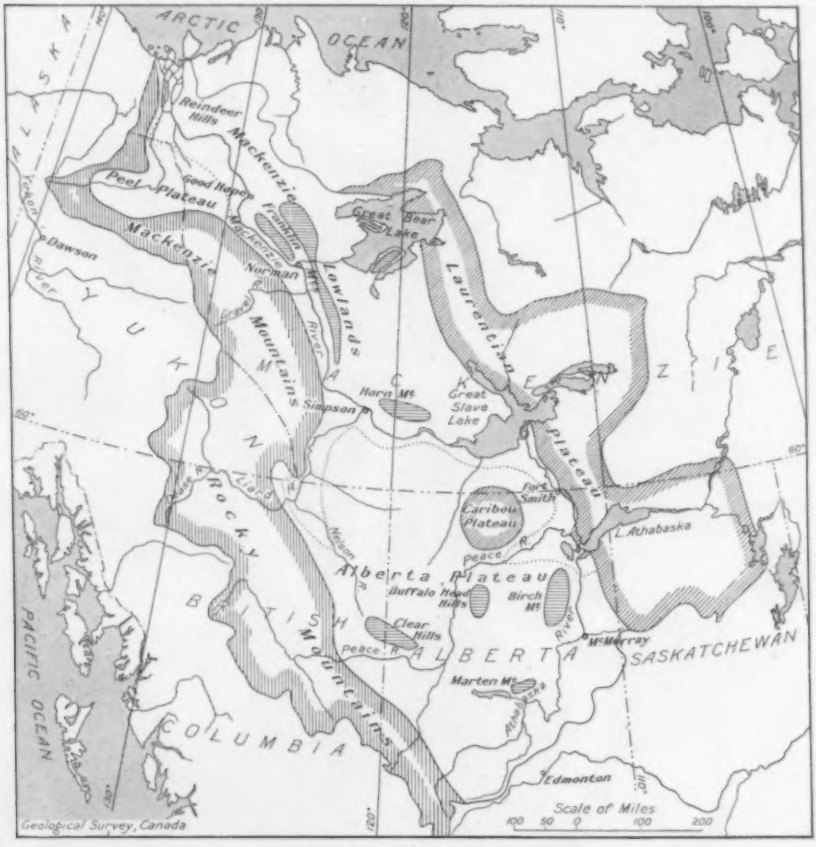

FIG. 1—Diagrammatic map of the physiography of the Mackenzie River basin. (After Camsell and Malcolm: The Mackenzie River Basin, *Geol. Survey of Canada Memoir* 108, 1919.)

covered with ice. The sudden rush of the Liard waters and broken ice across and through the deeply frozen surface of the Mackenzie is a spectacular feature of the break-up at Simpson. The jammed ice frequently piles high above the Hudson's Bay Company's stockade at Simpson before the firm ice of the main stream gives way and lets the Liard waters crash a channel across the Mackenzie. McConnell gives the following account of the Liard breaking into the Mackenzie:

At midnight the dam at the mouth of the Liard gave way, and the massive crystal structure was hurled by the liquid energy behind it against the firm ice in front with such force that the whole sheet, for some miles below the fort, was crushed into fragments by the impetuosity of the assault.[8]

The appearance of the ice encountered on the river bank after the jam has given way and the water fallen, is shown in Figure 5. The moving mass of ice set free by the break-up is shown in Figure 6. There is scarcely a mile of the river banks that does not show traces of the destructive work done by these great blocks as they travel seaward. In some places the spruce trees at the top of the banks have been snapped off like straws;

FIG. 2—Winter travel on the Athabaska River.

in others the clay banks have the appearance of having been plowed by titanic plows. In late summer the gravel bars about the mouths of tributary streams often show numerous grooves cut by the shoving of grounded ice blocks.

The Nelson River, which is the largest southern branch of the Liard, breaks up, it is said, as early as the main stream which, as stated above, opens the Mackenzie below Simpson more than a month before steamers can get through the ice on Great Slave Lake. The Nelson is large enough for navigation by small steamers as far as Fort Nelson, 100 miles above its mouth, and for flat boats still farther south. The construction of a wagon trail or railway from St. John on the Peace to the upper part of the Nelson River, a distance of about 175 miles, would give access to the Mackenzie River more than a month earlier than is now possible, owing to the late opening of Great Slave Lake. The success of the first oil well ever drilled

[8] R. G. McConnell: Report on an Exploration in the Yukon and Mackenzie Basins, N. W.T., *Ann. Rept. Geol. Survey of Canada*, Vol. 4 (N. S.), 1888–89, pp. 1 D–163 D; reference on p. 87 D.

in the Mackenzie Valley in getting oil during the past season may eventually lead to the serious consideration of this entirely feasible method of lengthening the navigation season of the Mackenzie by one month.

McConnell, the pioneer geologist in the Mackenzie Valley, spent the early spring of 1888 at the mouth of the Liard. His graphic description of early spring conditions follows:

> The warm weather which commenced on the 1st of May continued throughout the month, and under its influence the snow quickly disappeared, and the spring advanced with astonishing rapidity. On the 20th of April, the first day the temperature rose above freezing point for nearly six months, the barking crow (*Corvus americanus*) made its appearance.

FIG. 3—Fishing through the ice on Great Slave Lake.

> The raven (*Corvus corax*) had remained throughout the winter. On the 1st of May some Canada geese (*Branta canadensis*) were seen at the edge of an open place in the river, accompanied by a flock of mergansers and other ducks. The 4th brought the robin (*Turdus migratorius*) and some sparrows, and on the 5th the wavies (*Anser hyperboreus*) which usually lag a few days in the rear of the Canada geese, commenced to wing their way northwards and in a couple of days were passing in such numbers that flocks were rarely out of sight.[9]

In speaking of the western tributaries of the Mackenzie River in a region some 400 miles north of the mouth of the Liard, Keele[10] states that the rivers open between May 10 and May 20 and flood water comes down early in June.

MIDSUMMER CONDITIONS

All traces of winter conditions have disappeared from the Mackenzie Valley by the time the first steamer is able to get through Great Slave Lake to the head of the river, which is usually early in July. Concerning the

[9] McConnell, p. 86 D.
[10] *Op. cit.*, p. 23.

climate of early summer Keele, who wintered near the head of the Gravel River, remarks that "June is a perfect summer month with practically no darkness and on fair days nearly twenty hours of bright sunshine; the temperature sometimes reaches as high as 90°."[11] The nearly continuous sunshine of June is the great factor in the exceedingly rapid development of vegetation. "Compared with Ottawa, Simpson has an average of three hours more sunlight daily for the summer months, which means about eighteen days of additional sunshine during the three months when sunshine is most important."[12]

FIG. 4—The last stage of winter ice on Great Slave Lake. (Photograph taken June 28, 1917.)

The traveler in the Mackenzie Valley who sees for the first time the limestone scarps and cliffs of the Mackenzie Mountains so near the Arctic Zone entirely free of snow in midsummer, is apt to be surprised when he recalls the glaciers and permanent snow fields which are familiar features of the same mountains many hundreds of miles farther south. The Nahanni Mountains of the Mackenzie Valley, which are quite free of snow in July, are in about the same latitude as the mouth of Frobisher Bay, Baffin Land, where the writer has seen a ship stuck for days in the ice floes and experienced a snow storm late in July. The warm genial summer climate of the Mackenzie Valley cannot fail to impress anyone who is familiar with the bleak coasts of northeastern America which lie in the same latitude. Although the middle portion of the Mackenzie Valley lies in about the same latitude as Baffin Land, its summer climate bears a much stronger resemblance to that of the Gaspé Peninsula in the Gulf of St. Lawrence than it does to the Baffin Land summer. Camsell, who has a more intimate knowledge of the climate of the Mackenzie Valley as a whole than anyone else

[11] *Op. cit.*, p. 22.

[12] Charles Camsell and Wyatt Malcolm: The Mackenzie River Basin, *Geol. Survey of Canada Memoir 108; Geol. Ser. No. 92*, Ottawa, 1919, p. 43.

who has written on the subject, states that "in general it may be said that any point in the Mackenzie basin has a milder climate than any corresponding point of the same latitude in northern Manitoba, Ontario, or Quebec."[13] The relatively warm summer climate of the Mackenzie Valley may be ascribed chiefly to its remoteness from the chilling influence of Hudson Bay and to its low average elevation. Most of this great lowland is less than 500 feet above sea level, while much of the northern half of Alberta immediately south of it lies 2,000 or more above tide. Warm air currents from the Pacific may also be a factor.

FIG. 5—Stranded silt-covered ice left on the bank after the Liard has broken across the Mackenzie. (Photograph by Captain Mills.)

Many varieties of flowers in bloom crowd the fire-cleared spaces of the lowland and the mountain slopes early in July. Among these, two species of orchids occur locally in abundance. Ripe red raspberries were seen on August 7 at Bear Mountain, which is about 80 miles south of the Arctic Circle. Blueberries were a feature of the writer's camp fare from the first week in August to the end of the summer. The wild strawberry is abundant along the Mackenzie as far north as Simpson, at the mouth of the Liard, which appears to be near the northern limit of its range. No trace of it was seen north of Simpson, and inquiry failed to elicit any evidence of its having been seen by others farther north.

The gardens of the agents of the trading companies which may be seen at intervals of 150 to 200 miles along the Mackenzie show that excellent crops of all the more hardy garden vegetables may be grown in favorable seasons as far north as the Arctic Circle. Potatoes which the writer selected from a field at Simpson weighed in two or three cases a few ounces over a pound each. A turnip—the largest of a lot purchased for camp use from an Indian garden at Simpson—had a length of nine inches and a diameter

[13] *Op. cit.*, p. 43.

of five inches, the long tap root not being included in these figures. Oats and barley are raised at Simpson, though ripening is uncertain, and a few cattle are kept there on the Government farm. There is however, always the possibility of an August or July frost destroying the vegetables which in favorable seasons compare well with those raised in southern Canada.

Thawing in the upper part of the Mackenzie Valley proceeds downward a few feet below the surface in summer. Mr. Harris, who is in charge of the Government farm at Simpson, states that his well entered frozen ground at a depth of about 5 feet and passed out of frost at about 40 feet. A frost limit of 40 feet is in sharp contrast with the conditions prevailing in the Yukon valley and the Nome district in Alaska. Near Nome a shaft 120 feet deep did not penetrate below perpetual frost. Cleveland Abbe states that "there is only one instance on record where excavation in this northwestern region has gone below the zone of perpetual frost."[14] This is a Klondike shaft which passed through the frost zone into flowing water at about 220 feet.[15] The relatively moderate depth of frost penetration in the upper Mackenzie Valley as compared with the lower limit of frost in the Klondike and much of northern Alaska clearly indicates a less rigorous climate.

Autumn Conditions

The writer spent the latter part of August and the first ten days in September in the Wrigley district. At river level the first frost came here on September 1. Snow made its first temporary appearance on the summits of the mountains east of Wrigley (latitude 63° N.) on August 21. After September 7 the summit of Cap Mountain above 4,400 feet was permanently snow-covered. We left Wrigley for Simpson on September 10. In tracking up the Mackenzie and the lower Liard from Wrigley we found the somber dark green of the landscape enlivened by the bright yellow of the numerous patches of poplar which break the otherwise continuous spruce forests. This is the ideal part of the year in the Mackenzie Valley. The mosquito pest, which greatly abates late in August, disappears altogether with the first frost. One can then discard one's protective head net and canvas gloves, which earlier are absolutely essential to comfort if not existence, and sleep comfortably in the open when making short trips inland from the river.

Nearly perfect weather for outdoor work prevailed during most of the month of September. Wild gooseberries in good condition and four species of plants in bloom were seen at Simpson on September 28, the date of our departure for the "outside," as all railway-served lands are called in the north.

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[14] A. H. Brooks: The Geography and Geology of Alaska, A Summary of Existing Knowledge; with a Section on Climate, by Cleveland Abbe, Jr., *U. S. Geol. Survey Professional Paper No. 45*, Washington, D. C., 1906, p. 147.

[15] J. B. Tyrrell: A Peculiar Artesian Well in the Klondike, *Engineering and Mining Journ.*, Vol. 75, 1903, p. 188.

The Coming of Winter

At Simpson the first notable freeze of the season of 1919 occurred on the night of September 25. Thin ice on quiet pools and a crust on wet ground were noted on the 26th. The first strong hint of the approach of winter was encountered at Providence, 50 miles below the head of the Mackenzie (latitude 61° 25′ N.) At that point the writer found two or three inches of snow covering his blankets on waking October 1. At the head of the Mackenzie River in Wrigley harbor we found Mr. Camsell, Hudson's Bay Company factor at Simpson, with the Steamer *Liard River*, which had towed half a dozen Indian scows up to the lake where the main winter supply of

Fig. 6—Ice moving down the Mackenzie at Norman.

fish for men and dogs is caught late in September and early in October. Fishing, however, does not cease with the coming of ice, as may be seen from the photograph, Figure 3. It was still too early for ice to form on Great Slave Lake when we crossed it early in October. According to Hudson's Bay Company journals kept at Rae on Great Slave Lake, the earliest closing of the lake recorded there is October 6, 1864. In 1857 ice closed the lake on October 19, and in 1880 on October 28.[16] Ordinarily the upper Mackenzie is closed to canoe navigation by running ice about the middle of October. Mr. Blow, a missionary, informed the writer that in 1918 the Mackenzie first froze over at Norman on November 6. It broke and finally froze solid on November 11. A. H. Harrison[17] found the lower Mackenzie still open at Arctic Red River on October 4 in 1905 although he had encountered floating ice several days earlier.

A light snow covered the entire landscape when the launch carrying the writer's party arrived at the foot of Smith Rapids on October 4. This

[16] Russell, *Op. cit.*, p. 86.
[17] Harrison, *Op. cit.*, p. 28.

snow remained during the four days spent in portaging the 16 miles of rapids and getting started again on the upper Slave, and snow-covered river banks were a feature of the landscape during the remainder of the journey.

The freeze-up of the Slave was not yet due for two weeks according to those familiar with the river, but the low temperature, snow, and frozen ground strongly suggested its imminence at the time of our departure from Fitzgerald at the head of the Smith Rapids. Thin cakes of floating ice, which were encountered constantly after leaving this point, became steadily more numerous and thicker. On reaching the mouth of the Peace an attempt to avoid a rapid in the Slave by going through the delta of the Peace via the Quatre Fourches Channel failed because solid ice had entirely closed this relatively sluggish channel. We were forced to retrace our way back to the swifter main channel of the Rocher River leading to Lake Athabaska. Much ice was encountered in the very shallow western arm of the lake. The ice conditions met with from near the head of the Slave to the mouth of the Clearwater are indicated in the following excerpt from the writer's notes:

Oct. 9. Turned back by ice in the Quatre Fourches Channel in afternoon. Ice 1 inch thick. Where broken up and overslid, 2 to 4 inches thick.

Oct. 10. Met constant floes of fresh pan ice in upper part of Rocher River.

At Chipewyan (on Lake Athabaska) the protected bays have about 1 inch of ice over them, but no ice in the wind-swept water.

In shallow western end of lake ice is abundant except in the main current of the river.

Oct. 12. Much ice in middle of river in A. M. ⅛ inch thick, but in floating sheets. Quite cold during last night.

Oct. 13. Reached McKay (50 miles below McMurray) in A. M. where we abandoned the scow, which was nearly cut through by ice, transferring baggage to two skiffs. One skiff was broken through by ice and set adrift in afternoon. Reached the steamboat cache at night. River nearly covered by floating ice pans of all sizes up to 60 feet across, but all moving.

The current and contact of the ice pans tends to give them a rotary motion, tending to round off the corners and make circular pans.

Oct. 14. Started on foot for McMurray (16 miles) this A. M. after sleeping in the open under a spruce tree very comfortably. Launch was beached, repaired, and followed with baggage.

Small streams and channels of river with no current frozen over solid with smooth ice.

Big pans of ice five or six inches thick moving freely in current but extending nearly across the river. These floating pans, though thick, are mushy; but where there is no current, hard ice 1 to 2 inches thick.

Reached bank of Clearwater about 4.30 P. M. Crossed in canoe in thick floating ice to McMurray.

The southern channel of the Clearwater at McMurray we found frozen solid enough to permit of crossing on foot.

The nearly continuous sheet of moving ice in the Clearwater made navigation impossible about 18 miles from McMurray, so that the last 35 miles of the journey back to the railroad was accomplished on foot.

People residing at McMurray assured the writer that the freeze-up in 1919 came several days earlier than usual. But that it was not without precedent is shown by Hanbury's experience some 18 years ago. He was frozen in at McKay (where we abandoned the scow) on October 15 and resumed his journey a month later with dogs.[18] Information from various sources indicates, however, that in 1919 winter began at an unusually early date. The freeze-up came equally early on the Yukon River. The newspapers, under date of October 15, reported two steamers delayed and one frozen in north of Dawson. D'Arcy Arden, who shares with another man the distinction of representing the only white inhabitants of the immense region comprising the basin of Great Bear Lake, writes as follows concerning the early arrival of winter on Great Bear Lake in 1919:

> I was frozen in on October 4 at Cape McDonnell, Great Bear Lake, after being in the worst storm I have ever seen, lasting five days. I lost both my anchors and every foot of line I had and landed up on a sandy beach on a small island eighty miles from home.[19]

The early appearance of winter conditions did not yield, in 1919, to temporary milder weather. Snow and frozen ground were encountered all the way from Fort Smith to Edmonton where the temperature on October 25 was reported to be 15° below zero. In traveling eastward a continuous sheet of snow was found late in October as far as western Ontario.

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[18] D. T. Hanbury: Sport and Travel in the Northland of Canada, London, 1904, p. 253.
[19] Letter of August 10, 1920.

THE ORIGIN OF LAKE ATHABASKA*

By F. J. Alcock
Geological Survey of Canada

Lake Athabaska is the most southerly and the smallest of the three large lakes which drain, by means of the Mackenzie River, into the Arctic Ocean. The general relations of the lake are shown in the diagrammatic map of the Mackenzie Basin, on p. 391. It lies in the physiographic province known as the Laurentian Plateau near the western margin where it borders on the Great Plains. The lake has a length of 205 miles, a maximum width of 35 miles, and an area of approximately 2,850 square miles. Its shore line has a length of over 750 miles; 150 miles longer if the numerous islands be included. The northern shore with its many long, narrow, irregular bays is largely responsible for this excessive length. Here is a youthful shore line produced by the flooding of an uneven land surface.

The southern shore presents a very different set of features. It is dominantly composed of sand beaches resulting from the erosion of the flat-lying beds of Athabaska sandstone which extends along the southern shore of the lake. Back from the shore at the eastern end of the lake the sandstone beds form an escarpment rising in places to a height of 400 feet above the lake. The western half of the southern shore consists of sand beaches, bordered by low sandstone cliffs. Going southward from the lake the ascent is here gradual across a sandy plain to a plateau surface formed upon Athabaska sandstone. On William River the first outcrop of sandstone is encountered 12 miles from the lake. Above this point the ascent is more rapid, the river being marked by short cascades at the edges of outcropping layers of sandstone.

The country surrounding the lake shows the features which are so uniform over the Laurentian Plateau—moderate relief and disorganized drainage. However, the altitude of the upland surface in the neighborhood of Lake Athabaska varies from about 800 feet to 1,300 feet above sea level, a difference of relief which is greater than that shown by much of the plateau. North of the lake the country is a monotonous region of low rocky hills and ridges, separated by depressions which for the most part are occupied by lakes or muskeg swamps. Few of the hills are more than 300 feet in height; they are commonly well rounded on top and are covered with small jack pine, spruce, and poplar. The general trend of the ridges is northeast, and their sides are commonly very steep. This northeast trend is largely due to rock structure. North of the lake both the foliation of the gneisses and the bedding of the Pre-Cambrian sediments have a northeasterly strike, a feature which influenced the preglacial drainage.

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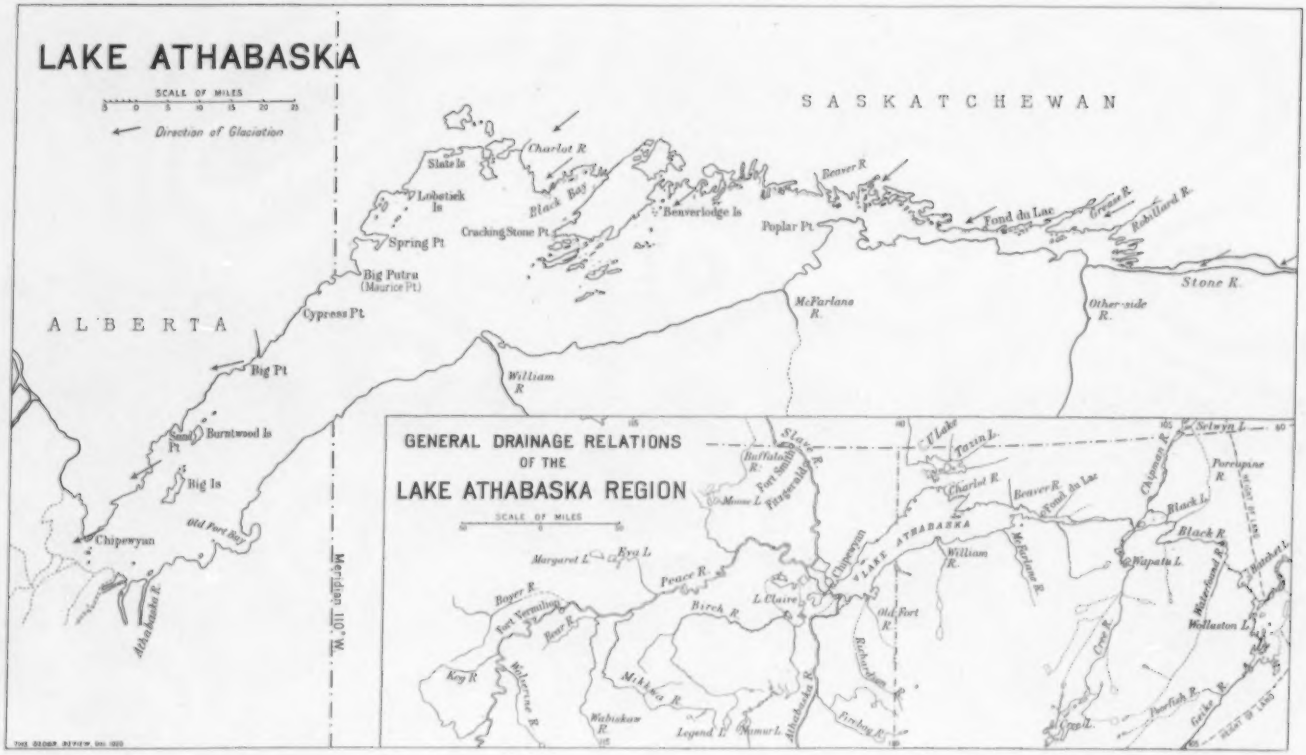


FIG. 1—Outline map of Lake Athabaska. Inset is shown the drainage of the region around the lake. The relation of the lake to the Mackenzie River system as a whole is shown in the diagrammatic map, p. 391.

The present streams of the region, like those of the Laurentian Plateau in general, are marked by lake expansions, rapids, waterfalls, and narrow gorges. Others flow in valleys which are big and wide and out of all proportion to the streams draining them. It is a drainage system which has been completely disorganized by Pleistocene glaciation.

The Origin of Lake Athabaska

A basin of the size of that occupied by Lake Athabaska must be explained as due either to tectonic or erosional forces or both. The best criterion which we can employ as to the applicability of the former lies in the structure of

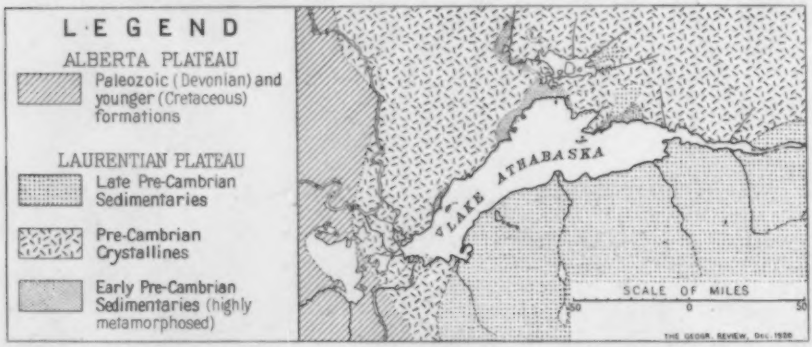
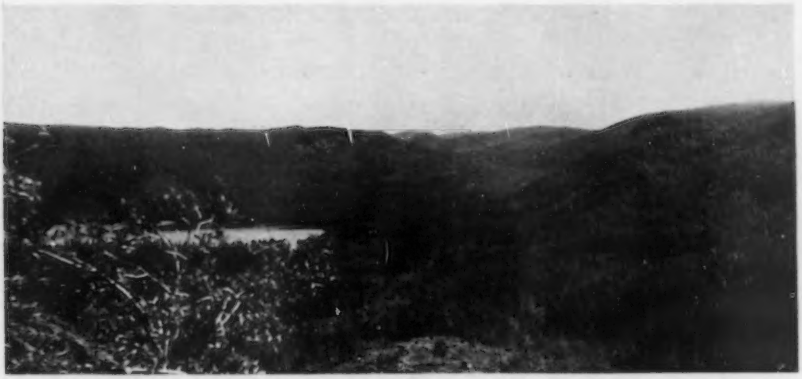


Fig. 2—Geological relationships in the Lake Athabaska area (from the Geological Map of the Dominion of Canada, 1913, scale 1:6,336,000, and the map of the Mackenzie River Basin accompanying Geol. Survey of Canada Memoir 108, 1919, scale 1:3,100,000). The lake which lies on the edge of the Laurentian Plateau occupies a glacially eroded depression at the contact of Pre-Cambrian crystallines and late Pre-Cambrian sedimentaries.

the youngest bed-rock formation of the region, the Athabaska sandstone. This is a clastic formation of wide extent which forms outcrops south of Lake Athabaska and exposures of smaller extent along the northern shore. On the southern shore at the eastern end of the lake it forms cliffs, in places 400 feet in height. It lies in an essentially horizontal position. The outcrops on the northern shore in the immediate vicinity of the lake likewise are flat-lying. The fact that there are no prevailing dips towards the lake on either side points to an absence of control by folding for the formation of the basin. The extreme irregularity of the northern shore and great variations in the width of the basin also suggest a lack of control by faulting.

It may also be inferred from the character of the preglacial topography that the basin is due to glacial rather than structural control. The present low relief displayed over the Laurentian Plateau is an inheritance from Pre-Ordovician times. A study of the profiles at the base of the Ordovician sediments, which still overlap the Pre-Cambrian rocks in the Hudson Bay-James Bay region and along the southwestern margin of the plateau northwest of Lake Winnipeg, shows that the surface upon which the advancing Ordovician sea deposited its sediments was a clean surface of extremely



A

B

C

FIG. 3—Characteristic topography in the Lake Athabaska region. A shows the monotonous country of low hills north of Lake Athabaska. B is from Grease Bay on the northeastern shore of the lake, C, the valley of the Stone River east of Lake Athabaska, a topography developed on the flat-lying Athabaska sandstone.

low relief with only minor irregularities. It may be inferred that in Pre-Ordovician times the Canadian shield was base-leveled, and its wide extent suggests that the process was by means of subaerial agencies. In the advanced physiographic stage which the region had attained lakes would be absent, for long before this condition had been reached any lakes would have been drained or filled. Even if part or all of the region was subsequently covered by mantles of Palaeozoic or Cretaceous sediments, the long erosion of Tertiary time would have effected similar conditions. It may be accepted that in preglacial times there was no lake or basin where Lake Athabaska now lies.

It is permissible to conclude, therefore, that the basin of Lake Athabaska is due to glacial causes, either erosional or depositional. It is extremely

FIG. 4—A typical rock cliff, north shore of Lake Athabaska.

probable that the main preglacial drainage was much like what it is today. The line separating the Athabaska series from the older rocks on the north very probably marked a wide preglacial valley which drained as now to the Mackenzie. The enlargement of such a valley by glacial erosion or its damming by glacial deposition or a combination of these two factors would most readily explain the formation of the lake basin. No evidence of a morainal dam, however, exists. The western end of the lake is low-lying and is the meeting point of a number of rivers, the Athabaska from the south, the Peace from the west, and the Birch from the southwest—a set of conditions difficult to explain on the theory of a dam.

The alternative theory of a basin produced by ice erosion involves the question whether ice is able to erode rock. In the Athabaska region evidence of ice erosion is found in the rounded hills and islands and smoothed sides of channels, where the erosion is by molding and smoothing, and in many definite examples by the plucking of blocks of rock along joint planes. The latter is here probably the most important type of glacial work. A further way in which ice erosion has been accomplished is by the uniting of pot-holes, a process which was definitely located north of Lake Athabaska.

Some of the minor features of the topography of the northern shore also bear on the problem of glacial erosion. The prevailing trend of the embayments is in a northeasterly direction along the line of glaciation. The prevailing trend of many of these narrow bays parallel to the direction of glaciation and their deep V-shaped cross section is strongly suggestive of glacial erosion.

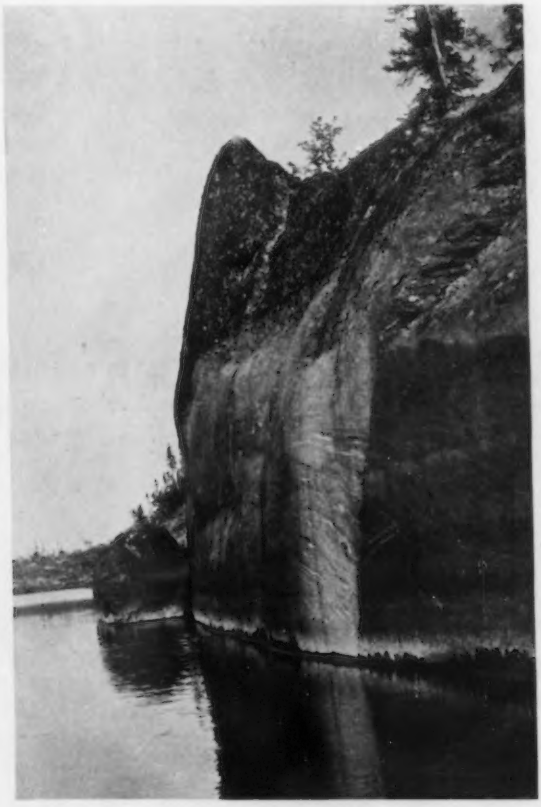


FIG. 5—The glaciated wall of a fiord-like bay, north shore of Lake Athabaska.

The general character of the lake is also significant of its glacial origin. A study of the striation directions plotted on a map of the region shows that the lake is widest and deepest where it lies parallel to the direction of glacial movement. The wide middle and western parts of the lake run in a southeasterly direction, while the narrow eastern part maintains a westerly direction at a considerable angle to the regional glaciation. These facts suggest that the preglacial Stone River flowed where Lake Athabaska now lies, that is, in a westerly direction to about the region of Black Bay and then

in a generally southwesterly direction. Where the ice moved directly down the valley the greatest amount of erosion was accomplished.

The amount of erosion which the Pleistocene glaciers accomplished in the valley in which Lake Athabaska now lies cannot be estimated accurately, but that it both widened and deepened the valley is fairly certain. The steep cliffs of sandstone on the southern shore and the equally abrupt cliffs of crystalline rocks on the northern coast in the narrow eastern part of the lake are not features which mark a mature valley in an old age of topographical development, and they can most easily be explained by lateral glacial plucking.

FIG. 6—An illustration of glacial plucking.

To what extent the basin of Lake Athabaska was deepened by glacial erosion involves a consideration of the depth of the lake. In many places the rocky coasts run down steeply under the water, and the impression that one gets is that the lake is deep. The only available record of sounding made in the lake is found on a map of Canada published in 1880 showing the country to be traversed by the Canadian Pacific Railway. At one place in Black Bay the depth is given as 32 fathoms, and at another place the words "no bottom" evidently indicate a considerably greater depth. A depth of 300 feet is probably a conservative estimate for the maximum depth of Lake Athabaska.

The preglacial Stone River certainly did not flow 300 feet below the present level of Lake Athabaska. It probably flowed at or even above the present level of the lake. This may be shown from the streams which empty into the lake. All flow over bed rock at no great distance from their mouths. This is true of the Stone River and all the smaller streams north of Lake Athabaska. The Athabaska River flows over Devonian limestone whose outcrop may be traced along the river to the head of the delta. On the Quatre Fourches Channel the presence of outcrops of granite gneiss shows that bed rock is at but a shallow depth below the river. Again at Fitzgerald on the Slave River, the outlet of Lake Athabaska, an exposure

of granite gneiss extends completely across the river, forming a rapid at an elevation of about 80 feet below that of Lake Athabaska. If the latter has a depth, therefore, of 80 feet its basin could not have been produced by a river flowing out down the channel of the Slave River.

It may be concluded that the basin of Lake Athabaska was deepened to the extent probably of 200 feet. How much of this was due to the removal of disintegrated material and how much of it was hard rock is impossible to determine. The general low relief of the region suggests, however, that most of it was hard rock such as is now exposed thereabouts.

As a further test of the validity of the argument of the production of basins by glacial erosion, a study of the other large lakes of the region such as Great Slave Lake and Great Bear Lake might be made. Unfortunately, however, the information regarding these lakes is very meager. In a general way however, they favor the conclusion made for Lake Athabaska. They are not structural basins, as is shown by the general flat-lying nature of the Devonian and Mesozoic strata exposed in places along their shores. Their bays for the most are likewise parallel to the direction of glaciation.

> The evidences of glaciation are well marked around Great Slave Lake. The general course of the striations is southwestward in conformity with the longer diameter of the lake basin, but it varies locally, the movements of the glaciers having adapted themselves to the trend of each bay or channel which approximated to that of the general course followed by the ice.[1]

This has recently been confirmed by A. E. Cameron. Speaking of the northern shores of Great Slave Lake, he says:

> The entire shore line shows clearly the effects of excessive glacial action. Many deep narrow bays stretch inland approximately parallel to one another in a direction about south 60 degrees west (magnetic) or north 80 degrees west (astronomical). That this direction is parallel to the glacial movement is shown by well marked striae on Windy Point.[2]

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[1] Robert Bell: Mackenzie District, *Summary Rept. Geol. Survey of Canada*, 1899, pp. 103 A–110 A; reference on p. 109 A.

[2] A. E. Cameron: Reconnaissance on Great Slave Lake, North West Territories, *Summary Rept. Geol. Survey of Canada*, 1916, Ottawa, 1917, pp. 66–76; reference on p. 69.

THE NEW BOUNDARIES OF HUNGARY

[With separate map, Pl. I, facing p. 410]

The treaty of peace between the Allied and Associated Powers and Hungary was signed at the Grand Trianon, June 4, 1920. The new boundaries of the Hungarian state as defined therein (article 27)[1] are here presented accompanied by a map (Plate I). The map has been prepared in a similar way to that showing the new boundaries of Austria (*Geographical Review*, December, 1919), and it is on the same scale. The boundaries were plotted on the relevant sheets of the Austrian staff map "Generalkarte von Mitteleuropa," 1:200,000, and, where necessary, on the "Spezialkarte der osterreichisch-ungarischen Monarchie," 1:75,000 and then transferred to atlas sheets in 1:750,000 on which the final drawing was made to be reduced to 1:1,500,000 in the engraving.

In the reprinted text each two paragraphs describing a segment of the boundary in the original have, for the sake of clearness, been combined into one throughout, as in our reprint of the Austrian treaty and in that of the Bulgarian treaty (*Geographical Review*, April-May-June, 1920). The spelling adopted is that of the Austrian maps. In the case of discrepancy between the 1:200,000 and the 1:75,000 sheets the latter has been followed.

ARTICLE 27

The frontiers of Hungary shall be fixed as follows (see annexed map):

1. *With Austria:*

From the point common to the three frontiers of Austria, Hungary, and Czecho-Slovakia, this point to be selected on the ground about 1 kilometer west of Antonienhof (east of Kittsee), southwards to point 115 situated about 8 kilometers southwest of St. Johann, a line to be fixed on the ground, leaving entirely in Hungarian territory the Karlburg-Csorna railway and passing west of Kr. Jahrndorf and Wüst-Sommerein, and east of Kittsee, D. Jahrndorf, Nickelsdorf, and Andau;

Thence westwards to a point to be selected on the southern shore of Neusiedler See between Holling and Hidegseg, a line to be fixed on the ground passing south of Pamhagen, leaving in Hungarian territory the entire Einser canal as well as the branch railway running northwestwards from the station of Mexiko, and then crossing Neusiedler See keeping to the south of the island containing point 117;

Thence southwards to point 265 (Kamenje) about 2 kilometers southeast of Nikitsch, a line to be fixed on the ground passing east of Zinkendorf and Nikitsch and west of Német Pereszteg and Kövesd;

Thence southwestwards to point 883 (Trott kö) about 9 kilometers southwest of Kőszeg, a line to be fixed on the ground, passing southeast of Locsmánd, Olmod, and Liebing, and northwest of Kőszeg and the road from Kőszeg to Salamonfa;

[1] Traité de paix entre les puissances alliées et associées et la Hongrie, protocole et déclaration. Du 4 juin, 1920 (Trianon). xx + 523 pp. [Paris, 1920.] 12½ x 8½ inches. Text in French, English, and Italian. Accompanied, in pocket, by map, 1:1,000,000, showing the new boundaries on a transfer of a section of the Royal Geographical Society's map of Europe on that scale.

Thence southwards to point 234 about 7 kilometers north-northeast of Pinkamindszent, a line to be fixed on the ground passing east of Rohoncz and Nagynarda and west of Butsching and Dozmat, then through points 273, 260, and 241;

Thence in a general southwesterly direction to point 353 about 6 kilometers north-northeast of Szentgotthard, a line to be fixed on the ground passing between Nagysároslak and Pinkamindszent, then south of Karácsfa, Németbükkös, and Zsámand and through point 323 (Hochkogel);

Thence southwestwards to a point to be selected on the watershed between the basins of the Raba (Raab) and the Mur about 2 kilometers east of Toka, this point being the point common to the three frontiers of Austria, Hungary, and the Serb-Croat-Slovene State, a line to be fixed on the ground passing east of Rábakeresztúr, Németlak, and Nagyfalva, west of the Radkersburg-Szentgotthard road and through point 353 (Janke B.).

2. *With the Serb-Croat-Slovene State:*

From the point defined above in an easterly direction to point 313 about 10 kilometers south of Szentgotthard, a line to be fixed on the ground following generally the watershed between the basins of the Raba on the north and of the Mur on the south;

Thence in a southerly direction to point 295 about 16 kilometers northeast of Muraszombat, a line to be fixed on the ground passing east of Nagy dolány, Orihodos with its railway station, Kapornak, Domonkosfa, and Kisszerdahely, and west of Kotormány and Szomorócz, and through points 319 and 291;

Thence in a southeasterly direction to point 209 about 3 kilometers west of Nemesnép, a line to be fixed on the ground following generally the watershed between the Nemesnepi on the north and the Kebele on the south;

Thence in a south-southeasterly direction to a point to be chosen on the Lendva south of point 265, a line to be fixed on the ground passing east of Kebeleszentmárton, Zsitkócz, Göntérháza, Hidvég, Csente, Pincze, and to the west of Lendva-Jakabfa, Bödeháza, Gáborjánháza, Dedes, Lendva Ujfalu;

Thence in a southeasterly direction, the course of the Lendva downstream;

Then the course of the Mur downstream;

Then to its junction with the old boundary between Hungary and Croatia-Slavonia, about 1½ kilometers above the Gyékényes-Koproncza railway bridge, the course of the Drau (Drave) downstream;

Thence southeastwards to a point to be chosen about 9 kilometers east of Miholjac dolnji, the old administrative boundary between Hungary and Croatia-Slavonia, modified, however, so as to leave the Gyékényes-Barcs railway, together with the station of Gola, entirely in Hungarian territory;

Thence in an easterly direction to point 93 about 3 kilometers southwest of Baranyavár, a line to be fixed on the ground passing north of Torjáncz, Löcs, and Benge and south of Kássád, Beremend with its railway station, and Illocska;

Thence in a northeasterly direction to a point to be chosen in the course of the Danube about 8 kilometers north of point 169 (Kis-Köszeg), a line to be fixed on the ground passing to the west of Baranyavár, Föherczeglak (leaving to the Serb-Croat-Slovene State the railway joining these two places at the junction immediately to the north of Baranyavár), and Dalyok, and to the east of Iván Dárda, Sárok, Udvár, and Izabellaföld (with its railway);

Thence east-northeastwards to a point in the course of the Kigyos about 3 kilometers east-southeast of Bács Madaras station, a line to be fixed on the ground passing between Herczegszánto and Béreg, and then approximately following the course of the Kigyos, but curving to the north of Rigyicza;

Thence east-northeastwards to a point to be selected on the backwater of the Tisza (Theiss) about 5½ kilometers east-northeast of Horgos station, a line to be fixed on the ground passing south of Kun Baya, cutting the Szabadka-Bács Almás railway about 1½ kilometers east of Csikeria station, cutting the Szabadka-Kiskúnhalas railway about 3

kilometers south of Kelebia station, and passing north of Horgos and its station, and south of Röszkeszentmihálytelek;

Thence in a southeasterly direction to the Tisza, the median line of the backwater;

Thence to a point to be selected about 5 kilometers upstream, the course of the Tisza;

Thence in a general easterly direction to a point to be selected on the ground about 4 kilometers southwest of Kiszombor station, approximately east-southeast of point 84 and south-southwest of point 83, this point being common to the three frontiers of Rumania, Hungary, and the Serb-Croat-Slovene State, a line to be fixed on the ground passing between Gyála and Oszentiván and between Óbeb and Kübekháza.

3. *With Rumania:*

From the point defined above east-northeastwards to a point to be selected on the Maros about 3½ kilometers upstream from the railway bridge between Makó and Szeged, a line to be fixed on the ground;

Thence southeastwards, and then northeastwards to a point to be selected about 1 kilometer south of Nagylak station, the course of the Maros upstream;

Thence northeastwards to the salient of the administrative boundary between the *comitats* of Csanád and Arad north-northwest of Németpereg, a line to be fixed on the ground passing between Nagylak and the railway station;

Thence east-northeastwards to a point to be selected on the ground between Battonya and Tornya, this administrative boundary, passing north of Németpereg and Kispereg;

Thence to point 123 (about 1.2 kilometers east of Magosliget), the point common to the three frontiers of Hungary, Rumania, and Czecho-Slovakia (Ruthenian territory), a line to be fixed on the ground passing west of Nagyvarjas, Kisvarjas, and Nagyiratos, east of Dombegyház, Kevermes, and Elek, west of Ottlaka, Nagy Pél, Gyula Varsánd, Ant, and Illye, east of Gyula, Gyula Vári, and Kötegyán, cutting the Nagy Szalonta-Gyula railway about 12 kilometers southwest of Nagy Szalonta and between the two bifurcations formed by the crossing of this line and the Szeghalom-Erdögyarak railway; passing east of Méhkerék, west of Nagy Szalonta and Marcziháza, east of Geszt, west of Atyás, Oláh-Szt.-Miklós, and Rojt, east of Ugra and Harsány, west of Kőrösszeg and Kőrös Tarján, east of Szakál and Berek Böszörmény, west of Bors, east of Artánd, west of Nagy Szántó, east of Nagy Kereki, west of Pelbárthida and Bihar Diószeg, east of Kis Marja, west of Csokaly, east of Nagy Léta and Álmosd, west of Ér-Selind, east of Bagamér, west of Ér-Kenéz and Ér-Mihályfalva, east of Szt.-György-Ábrány and Penészlek, west of Szaniszló, Bere Csomaköz, Fény, Csanálos, Börvely and Domahida, east of Vállaj, west of Csenger-Bagos and Óvári, east of Csenger-Ujfalu, west of Dara, east of Csenger and Komlód-Tótfalu, west of Pete, east of Nagy-Gécz, west of Száraz-Berek, east of Méhtelek, Gárbolcz, and Nagy-Hodos, west of Fertős Almás, east of Kis-Hodos, west of Nagy-Palád, east of Kis-Palád and Magosliget.

4. *With Czecho-Slovakia:*

From point 123 described above northwestwards to a point to be selected on the course of the Batar about 1 kilometer east of Magosliget, a line to be fixed on the ground;

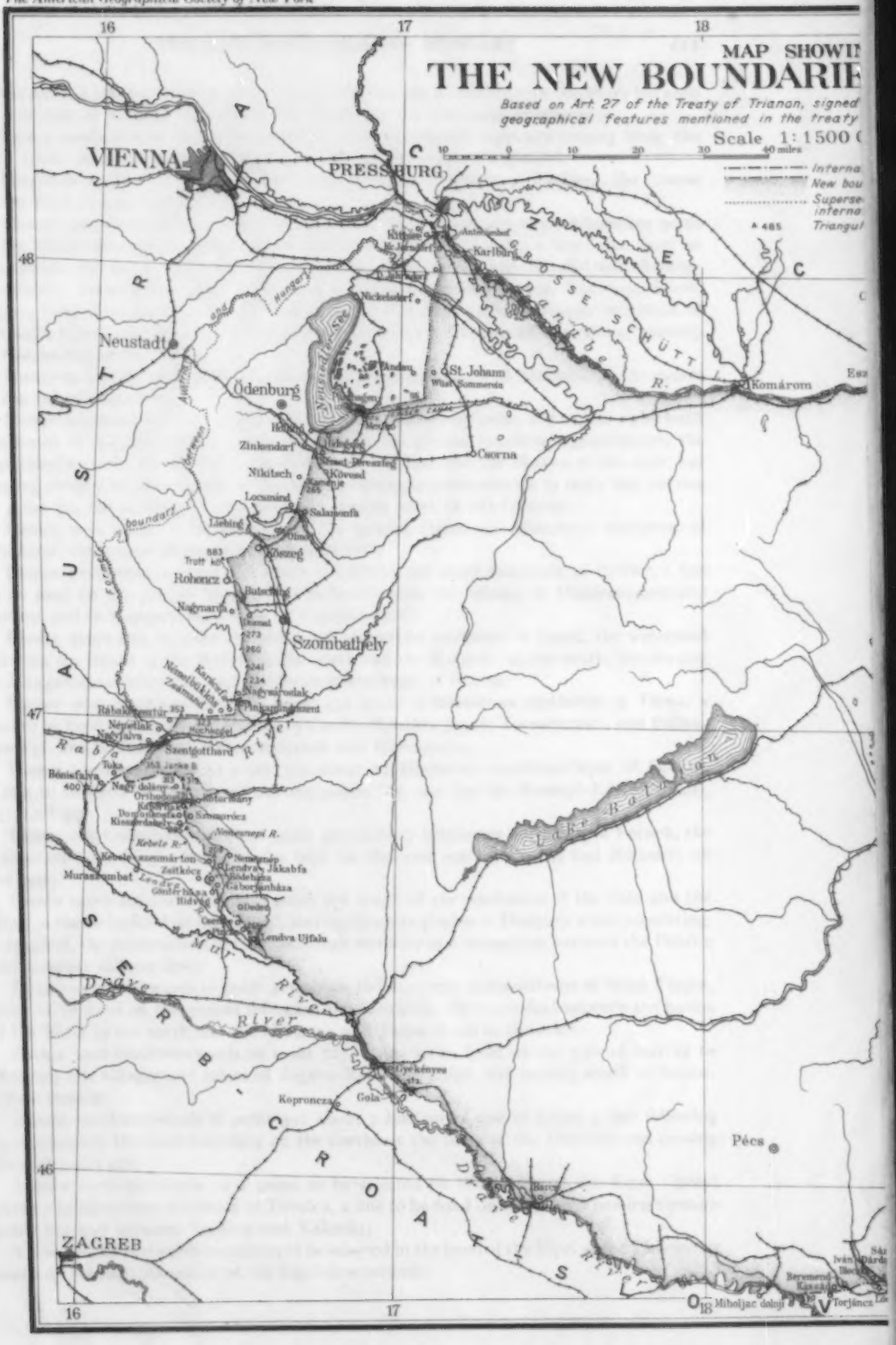
Thence the course of the Batar downstream;

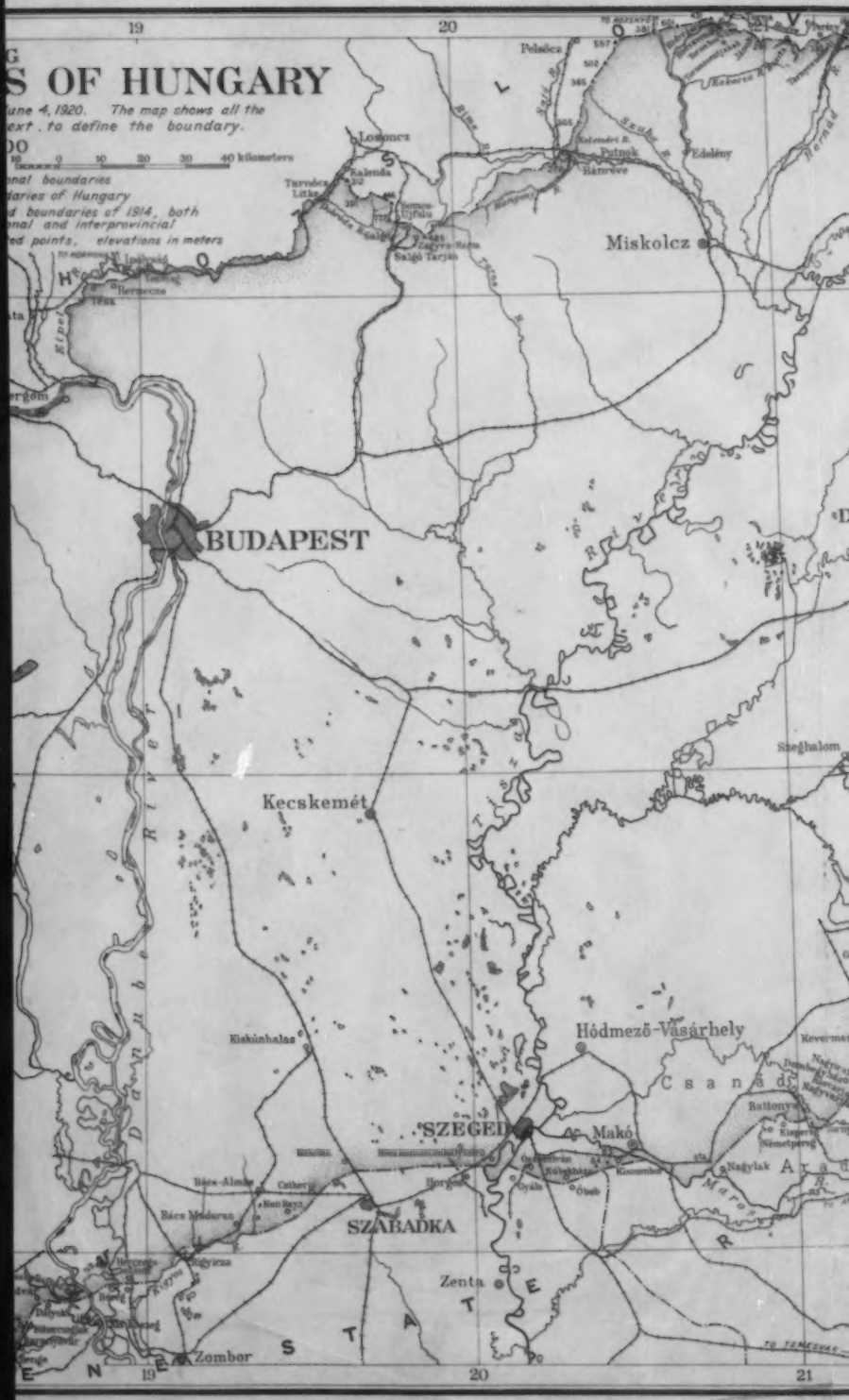
Then to a point to be selected on it below Badaló and near this village, the course of the Tisza downstream;

Thence north-northwestwards to a point to be selected on the ground northeast of Darócz, a line to be fixed on the ground leaving in the Ruthenian territory of Czecho-Slovakia Badaló, Csoma, Macsola, Asztély, and Déda, and in Hungarian territory Bereg-Surány and Darócz;

Thence northwestwards to the confluence of the Fekete Viz and the Csaronda, a line to be fixed on the ground passing through point 179, leaving in Ruthenian territory Mező Kászony, Lónyay tn., Degenfeld tn., Hettyen,[2] Horváthi tn., Komjáthy tn., and in Hungarian territory Kerek Gorond tn., Berki tn., and Barabás;

[2] Hetyen on the 1: 200,000 map.


MAP SHOWI
THE NEW BOUNDARIE
Based on Art. 27 of the Treaty of Trianon, signed
geographical features mentioned in the treaty
Scale 1:1500
Interna
New bou
Superse
inferna
Triangul
VIENNA
PRESSBURG
Neustadt
Ödenburg
Zinkendorf
Nikitsch
Csorna
Komárom
Rohonc
Szombathely
Lake Balaton
Kopronca
Pécs
ZAGREB
AUSTRIA
SERB-CROAT
Drave River
Mur River
Raab River
Danube R.
Hungary
Austria
boundary
16
17
18
48
47
46


S OF HUNGARY
June 4, 1920. The map shows all the
ext . to define the boundary.
00
0 10 20 30 40 kilometers
onal boundaries
daries of Hungary
d boundaries of 1914, both
onal and interprovincial
ed points, elevations in meters
BUDAPEST
Miskolcz
Kecskemét
SZEGED
Hódmező-Vásárhely
SZABADKA
Zenta
Zombor
Makó
Szeghalom
Mezőkövesd
Edelény
Losoncz
Pelsőcz
Rimava
Szuha R.
Hernad
Bodva R.
Sajó R.
Tarnóca Litke
Ipolyság
Rétsecze
Téss
Ipoly R.
Bácz-Almás
Bácz-Madaras
Csanád
Nagylak
Battonya
Kiszombor
Ó-Becse
Ujvidék
Titel
Tisza R.
Maros R.
Danube River
Bánát
Nemetperes
Kiskunhalas
Zenta
Zombor
19
20
21

DEBRECZEN
Nagy-Várad
Szatmár Németi
Nagy-Károly
Bereg
Szabolcs
Tisza
Hernád
Sárospatak
Sátoralja Ujhely
Nagy-Szalonta
Szeghalom
Gyula
Békés-Csaba
Mezö-Berény
Arad
Kevermes
Nagy-Léta
Ér-Mihályfalva
Ér-Kenés
Ér-Selind
Ér-Szentjobb
Bihar Diószeg
Artánd
Bors
Körös-Ladány
Rojt
Atyás
Mezö-Csáth
Penészlek
Vállaj
Csenger
Csenger-Ujfalu
Csenger-Gálos
Kis-Hódos
Nagy-Hódos
Garbolcz
Mátyánk
Nagy-Gécz
Komlód-Tótfalu
Ovári
Börvely
Szamos-Ujlak
Szamos-Becs
Nagy-Károly
Szaniszló
Sat.-György-Ábrány
Bagamér
Álmosd
Csékaly
Nagy-Kereki
Nagy-Szánló
Berek-Rézmüves
Szakái
Harsány
Körös-Jenö
Kördeszeg
Ugra
Mezö-Sas-Miklós
Geszt
Mezöhegyes
Mezö-Kovácsháza
Kötegyan
Ilye
Erdögyarak
Kevermes
Nagy-Pél
Elek
Battonya
Mezö-Berény
Gyula Vármegye
Gyula Város
Arad
Bohemia
Moravia
Upper Austria
Lower Austria
Styria
Tyrol
Carinthia
Carniola
Croatia-Slavonia
Bosnia
Serbia
Hungary
Galicia
Bukovina
Russia
Rumania
Italy
Adriatic Sea
RELATION
OF THE NEW
REPUBLIC OF HUNGARY
TO THE FORMER
AUSTRO-HUNGARIAN MONARCHY
Scale 1:15000000
50 0 50 100 miles

Thence to a point to be selected in its course above the administrative boundary between the *comitats* of Szabolcs and Bereg, the course of the Csaronda downstream;

Thence westwards to the point where the above-mentioned boundary coming from the right bank, cuts the course of the Tisza, a line to be fixed on the ground;

Thence to a point to be selected on the ground east-southeast of Tarkány, the course of the Tisza downstream;

Thence approximately westwards to a point in the Ronyva about 3.7 kilometers north of the bridge between the town and the station of Sátoralja Ujhely, a line to be fixed on the ground leaving to Czecho-Slovakia Tarkány, Perbenyik, Örös, Kis Kövesd, Bodrog-Szerdahely, Bodrog-Szög, and Borsi, and to Hungary Damóc, Láca, Rozvágy, Pácin, Karos, Felső Berecki, crossing the Bodrog and cutting the railway triangle southeast of Sátoralja Ujhely, passing east of this town so as to leave the Kassa-Csap railway entirely in Czecho-Slovak territory;

Thence to a point near point 125 about 1½ kilometers south of Alsómihályi, the course of the Ronyva upstream;

Thence northwestwards to a point on the Hernád opposite point 167 on the right bank southwest of Abaujnádasd, a line to be fixed on the ground following approximately the watershed between the basins of the Ronyva on the east and the Bozsva on the west, but passing about 2 kilometers east of Pusztafalu, turning southwestwards at point 896, cutting at point 424 the Kassa-Sátoralja road and passing south of Abaújnádasd;

Thence to a point to be selected on the ground about 1½ kilometers southwest of Abaújvár, the course of the Hernád downstream;

Thence westwards to point 330 about 1½ kilometers south-southwest of Perény, a line to be fixed on the ground leaving to Czecho-Slovakia the villages of Miglécznémeti and Perény, and to Hungary the village of Tornyosnémeti;

Thence westwards to point 291 about 3½ kilometers southeast of Jánok, the watershed between the basins of the Bodva on the north and the Rakacza on the south, but leaving in Hungarian territory the road on the crest southeast of Buzita;

Thence west-northwestwards to point 431 about 3 kilometers southwest of Torna, a line to be fixed on the ground leaving to Czecho-Slovakia Jánok, Tornahorváti, and Bódva-vendégi, and to Hungary Tornaszentjakab and Hidvégardo;

Thence southwestwards to point 365 about 12 kilometers south-southeast of Pelsőcz, a line to be fixed on the ground passing points 601, 381 (on the Rozsnyó-Edelény road), 557, and 502;

Thence south-southwestwards to point 305 about 7 kilometers northwest of Putnok, the watershed between the basins of the Sajó on the west and the Szuha and Keleméri on the east;

Thence south-southwestwards to point 278 south of the confluence of the Sajó and the Rima, a line to be fixed on the ground, leaving Bánréve station to Hungary while permitting, if required, the construction in Czecho-Slovak territory of a connection between the Pelsőcz and Losoncz railway lines;

Thence southwestwards to point 485 about 10 kilometers east-northeast of Salgó Tarján, a line to be fixed on the ground following approximately the watershed between the basins of the Rima to the north and the Hangony and Tarna rivers to the south;

Thence west-northwestwards to point 727, a line to be fixed on the ground leaving to Hungary the villages and mines of Zagyva-Róna and Salgó, and passing south of Somos-Ujfalu station;

Thence northwestwards to point 391 about 7 kilometers east of Litke, a line following approximately the crest bounding on the northeast the basin of the Dobróda and passing through point 446;

Thence northwestwards to a point to be selected on the course of the Eipel (Ipoly) about 1½ kilometers northeast of Tarnócz, a line to be fixed on the ground passing through point 312 and between Tarnócz and Kalonda;

Thence southwestwards to a point to be selected in the bend of the Eipel about 1 kilometer south of Tesmag, the course of the Eipel downstream;

Thence westwards to a point to be selected on the course of the Eipel about 1 kilometer west of Tésa, a line to be fixed on the ground so as to pass south of the station of Ipolyság and to leave entirely in Czecho-Slovak territory the railway from Ipolyság to Csata together with the branch line to Korpona (Karpfen), but leaving Bernecze and Tésa to Hungary;

Thence southwards to its confluence with the Danube, the course of the Eipel downstream;

Thence to a point to be selected about 2 kilometers east of Antonienhof (east of Kittsee), the principal channel of navigation of the Danube upstream;

Thence westwards to a point to be selected on the ground about 1 kilometer west of Antonienhof (east of Kittsee), this point being common to the three frontiers of Austria, Hungary, and Czecho-Slovakia, a line to be fixed on the ground.

A summary statement and estimate of the territorial, ethnic, and economic changes in the Hungarian State as defined by these new boundaries is given in the note on p. 415 of this number of the *Review*.

GEOGRAPHICAL RECORD

NORTH AMERICA

The Southern Red Hills of Alabama: A Study in Geographical Contrasts. The variation of human relations with the variation in physical conditions of a region is nicely illustrated by Roland M. Harper in the paper "Some Relations Between Soil, Climate, and Civilization in the Southern Red Hills of Alabama" (*South Atlantic Quarterly*, July, 1920). The southern red hills region, a division of the Coastal Plain of the southeastern United States, stretches from South Carolina to Mississippi as a red loamy belt contrasting strongly in its topography with the level sandy belts nearer the coast and bearing superficially a resemblance to the Piedmont (compare the map, Fig. 5, p. 380, and the diagram, Fig. 7, p. 383, illustrating the article by H. F. Cleland on "The Black Belt of Alabama"). In Alabama there is a somewhat pronounced contrast between the eastern and western sections of the belt itself. The east presents broad upland stretches cut by narrow swampy valleys. In the west dissection has proceeded further; the divides are reduced to narrow ridges, the valleys are broad. There also exists a climatic difference dependent on the progressive retardation of summer rains as one goes east from the Great Plains to Florida. In the western red hills the rainfall from April to June exceeds that from August to October. In the east the reverse is the case. Thus Pushmatcha, near the western edge of the state, has an excess of early summer rainfall over that of late summer amounting to 5 inches. Eufala, on the eastern edge, has an excess of 1.5 inches in the reverse direction. Associated with this is a variation in soil fertility. Apparently the warm rains of late summer exercise a more efficient solvent action, leaching out the agronomically valuable mineral salts to a greater extent. With other factors this combines to give the advantage of soil fertility to the western section. That this is the case is well shown in the natural vegetation; thus the much greater abundance in the west of the sweet gum, a tree flourishing on the richer soils.

It is principally the advantage of soil fertility that is reflected in the earlier development of the western section of the red hills, though in some degree it may be attributed to greater accessibility. In 1820 the population of the western section was 4.7 to the square mile to 1.1 in the eastern section. Just before the Civil War the ratios were 11.5:7.3. It was not until the last decade of the century that the extension of railroads and the use of commercial fertilizer turned the balance in favor of the east with its smoother topography and lighter soils.

Today in percentage of land in farms, in area of improved land; in size of farms; in value of land, of farm property, of crops the east is superior to the west. But in dealing with these statistics it must be remembered that one is dealing with a region occupied by two races in unequal proportions. The early development of the western red hills was particularly associated with cotton cultivation and slave labor. In 1850 the whites in the western section formed only 47 per cent of the population against 83 in the east (in 1910 the ratios were 37:68). In *ante bellum* days the eastern section had no large plantations. Associated with this is a condition which Harper has elsewhere shown obtains generally in the South where the negro population exceeds that of the white (see the note "The Culture of the Southern States," *Geogr. Rev.*, Vol. 8, 1919, pp. 274–275). Among the white population of such regions the standard of living is comparatively higher than that among their neighbors where the negro is in the minority. Thus the illiteracy figure for the white population of the western red hills is 7.6 per cent against 13.1 per cent in the eastern red hills. In 1910 in the west the white farmer cultivated nearly twice as much land as his colored neighbor, and he lived in a house worth four times as much. In the east the land cultivated by white and negro farmers was about equal, while the value of the house of the former was about twice that of the latter. (Further details are given by Harper in "Resources of Southern Alabama," *Geol. Survey of Alabama Special Rept. No. 11*, 1920.)

And so in other relations contrasts are seen between these two sections of Alabama. As a whole the study is noteworthy in that it shows the importance of a geographical evaluation of census statistics.

Geographical Conceptions of a Primitive People: Yurok Geography. The Yurok Indians live in scattered settlements along the lower reaches of the Klamath River of northwestern California and for a distance of forty-two miles up and down the coast on either side of the river mouth. In "Yurok Geography" (*University of California Publications in American Archaeology and Ethnology;* Vol. 16. No. 5, 1920) T. T. Waterman gives an account of the geographic ideas of this primitive people and of the geographic conditions of their life.

Yurok cosmography is refreshingly naïve and childish; like most early people, these Indians think the earth is circular and surrounded by the ocean. The Klamath rises in the salt water to the east and cuts across the world, the center of which would seem to be a point near the confluence on the Klamath with the Trinity.

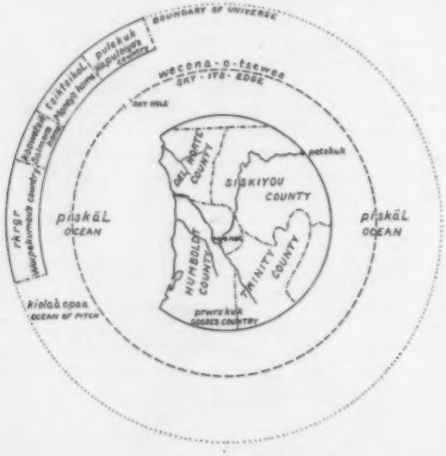


FIG. 1—Diagram illustrating the Yurok idea of the world.
Reproduced from Figure 1 of the article cited in the text.

The Pacific bounds the land to the west, and one reaches the ocean in Humboldt County, Siskiyou County and southern Oregon to south, east, and north respectively. Not many miles beyond, the dome of the sky—pierced by a hole through which the wild geese fly—comes down to the waters. One can pass beneath the edge of the sky and reach a variety of mysterious regions on the western border of the universe.

The Yuroks do not express directions in terms of the heavenly bodies or of the compass; the river being an essential feature of their life, their fundamental conceptions of direction are *pets* and *pul*, or "up river" and "down river;" and, as the Klamath where it enters the sea is flowing from the southeast, *pul*, or "down stream" is applied also to a northerly direction along the coast.

Waterman is of the opinion that "local geography seems to mean rather more to the Yurok than is ordinarily the case with Indian tribes." They have certainly given place names to innumerable localities and objects on their frequented ways of seacoast and river bank. Practically every boulder has its name and every stack of rock offshore or on the beach. On the other hand, large hills or even mountains in the back country are unnamed. Moreover the Klamath itself bears no distinctive title, probably because it enters so vitally into everyday life and thought.

Yurok "towns" are all very small, the largest one containing only twenty-five houses. They are mainly found along the streams and seashore. The ones on the river show a marked favoritism for the northern or sunny bank. A certain quarrelsomeness and disposition to engage in feuds was responsible for the founding of many "towns" by persons who, for a variety of reasons, desired to sever relations with their old homes.

EUROPE

The New Frontiers of Hungary. The treaty signed at the Grand Trianon (see this number of the *Review*, p. 408) has left unrecognizable the old Hungary, "Kingdom of a Thousand Years." The new boundaries, which have less than half their former length, do not touch the old ones at any point. Only is there coincidence in part with the old internal frontier between Hungary proper and Croatia-Slavonia. The boundary with Czecho-Slovakia is approximately 375 miles in length; that with Rumania 180 miles; with Yugo-Slavia 340 miles; with Austria 125 miles. Formerly distinguished by their predominantly "natural" character—river or mountain crest—the present boundaries are almost entirely conventional. They enclose an area of approximately 35,000 square miles against the former area of 125,600 square miles and a population of approximately 7,500,000 (210 per square mile) against a former population (census of 1910) of 20,886,447 (165 per square mile).

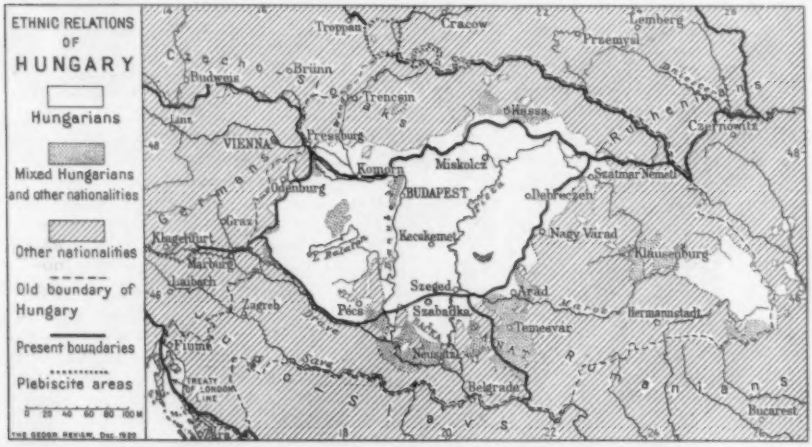


FIG. 1—Map showing the ethnic relations of the new Hungary. Scale approximately 1:10,000,000.

Drawn in general on the principle of nationality the new boundaries make certain departures on strategic and economic grounds (L. Eisenmann: La nouvelle Hongrie, *Ann. de Géogr.*, September, 1920).

The old Hungarian Kingdom was approximately half Magyar; the new state is almost purely Magyar. The chief non-Magyar element is to be found in the German enclaves west of the Danube; there are also a few islets of Slav population as for instance in the Pécs region. Hungary, however, has probably lost some 2,000,000 of her nationals. The 600,000 Szeklers of Transylvania are irretrievably separated from their *confrères* by a solid block of Rumanian population 120 kilometers broad. East of Debreczen the Magyar population stretching out to the foothills of the Bihar has gone to Rumania with the railroad from the Czecho-Slovakian frontier to Nagy Szalonta, and Rumania also gets the important railroad junction of Arad. In the Bačka is Szabadka (Subotica) with a large Yugo-Slav population (50,000) awarded to the Serb-Croat-Slovene State with the territory to the south, though thereby the transfer of three times as many Magyars is involved (The New Frontiers of Hungary, *The New Europe*, January 15, 1920). There are more than half a million Magyars in Czecho-Slovakia. The Hungarian loss here includes the ancient capital, Pressburg (Bratislava), whereby the Slav state gains the necessary outlet on the Danube. It is principally strategic reasons that extend the riverine frontier to Gran. Eastward a strip of Magyar population is also included in Czecho-Slovakia, giving the new state uninterrupted rail communications with Rumania.

Another ethnic change, more significant than the numbers alone suggest, is the increased proportion of the Jewish element—5 to 7 per cent. The Jews have played an important

part in the financial and professional life of Hungary, and their increased preponderance intensifies an old problem.

Hungary has always been an agricultural state. The new boundaries impose upon her a still more exclusively agricultural character, though she has lost some of her best crop producing areas, notably the maize and wheat lands of the Bačka and the Banat and the barley and sugar beet fields and rich pastures of the Little Alföld north of the Danube (compare B. C. Wallis: The Peoples of Hungary: Their Work on the Land, *Geogr. Rev.*, Vol. 4, 1917, pp. 465–481). Compared with the old capacity it is estimated that the new territory will produce the following percentages: rye, 62; barley, 47; wheat, 40; maize, 27; hay, 29; potatoes, 41; beets, 37; wine, 62. The change of régime, however, is favorable to agricultural development. In particular one may look for a breaking up of the *latifundia* about Lake Balaton, an area which has always contributed largely to the emigration movement. The sheep of Transylvania, the cattle and sheep of Slovakia and Ruthenia, and a well developed cattle industry along the late Austrian frontier are also lost to Hungary. The percentage productive capacity in respect to live stock is thus estimated: cattle, 31; sheep, 26; pigs, 44; horses, 40. The two latter, however, will suffer the loss of the maize fields and pastures of the Bačka and Banat.

In 1890, of the Hungarian population gainfully employed 71 per cent was engaged in agriculture; 12 per cent in industry. In 1910 the numbers were 62 and 17. This was the result not only of natural progress but of a well defined state policy, political as well as economic. The urban centers were the focus of magyarization. But with the loss of the bordering hill country Hungary lost her chief industrial resources. In 1913 Hungary mined 20,500,000 quintals of iron ore. Her present productivity is estimated at one-fifth; the important mines of the north (in Gömör) and the southeast (in Hunyad and Krasso-Szörény) are lost and also the salt mines of Máramaros and those of Transylvania. On the other hand most of the carboniferous deposits remain. With the exception of the Pécs basin, containing reserves estimated at 110,000,000 tons, these fuel resources are of no great significance; the lignite beds of the Bakony near Budapest are approaching exhaustion. As it was before the war Hungary imported about one-third of her coal requirements. Poverty in coal was partly compensated by resources in water power and natural gas—forces whose exploitation was just beginning. Even more serious is the loss of the forests, of which it is estimated only 17 per cent remain, including 6.5 per cent of the coniferous forests.

Hungary loses several industrial towns, and others in the Magyar country which—thanks particularly to the policy of railroad development (Hungary had a greater mileage per unit population than Germany)—easily received their raw materials from the mines and forests are cut off from sources of supply. Discounting the latter circumstance, however, and assuming that other conditions remain as before, the industrial capacity of the new Hungary as compared with the old is estimated thus: metallurgy, two-fifths; weaving and spinning of cotton goods, one-quarter; of linen, one-half; of jute, three-quarters; of wool, one-tenth; tanneries, one-half. The agricultural industries are somewhat more favorably placed: flour mills, three-fifths; sugar refineries, two-fifths; distilleries, one-half; tobacco factories, one-half. The working population is likewise placed at about two-fifths of its former magnitude.

Budapest has figured to an abnormal degree in the industrial life of the nation. It seems inevitable that for a time at least this city of nearly a million in an agricultural state of less than 8,000,000 must show some decline. Compared with Vienna, however, the situation of Budapest is greatly superior. As a capital city Budapest remains most advantageously placed.

AFRICA

Mauritius and Réunion. Though conquered from France by Great Britain in 1810 and forming a part of the British Empire ever since, Mauritius has always been the home of a people French in language, traditions, and sympathies. Particularly since the armistice of 1918, but also before, a "retrocessionist" movement has been aggressively fostered by the creole leaders who have argued with skill and plausibility that not only the interests of the islanders but those of the British Empire as a whole will be served if only Great Britain can bring herself to perform the *geste élégant* of restoring the old "Île de France" to its original mother country. As a result of this movement, public attention in France has recently been directed towards Mauritius and its French neighbor, Réunion. Incidentally

to the propagandist purpose for which they were written, two recent articles on this subject furnish us with important geographical details. Especially noteworthy is the description and comparison of Réunion with Mauritius by P. Carié in the May, 1920, number of *La Géographie*, but H. de Rauville's article in *Colonies et Marine* for June 30, 1920, is also a valuable study, though more political and historical in character and mainly devoted to proving how very French the Mauritians are.

Both islands are volcanic. In Réunion the cycle of erosion has not progressed as far as in its sister isle, the terrain is more mountainous, and consequently the cultivated area less extensive and the population less numerous, although the island itself is somewhat larger. The greater range of altitudes is partially responsible for a large diversity in the kinds of crops raised, whereas in Mauritius practically all the cultivable soil is given over to sugar cane.

There are three main classes of society in Réunion: the indolent African negroes, the so-called "little whites," and the upper class of business and professional men. The second is by far the most interesting and individual; composed largely of the descendants of seventeenth century French refugees from Madagascar this people earns a livelihood by carrying on small handicrafts and agriculture on a limited scale. Many individuals from the upper class have made a name not only in their native island, but also in France, and even Mauritius, though owing allegiance to Great Britain, has contributed not a few distinguished scientists, doctors, artists, lawyers, and soldiers to the service of the French nation.

The greatest obstacle in the way of the prosperity of Réunion has been the lack of cheap labor. The African element is too lazy and unreliable to be worth much, and emigration of Hindus from India to this French island has not been permitted for many years. Mauritius, on the other hand, was until 1907 open to Indian immigration, and there the Hindus and their children have been an invaluable resource (Indians formed 70 per cent of the population according to the 1911 census). Réunion furthermore suffers from the lack of a good harbor, whereas Mauritius rejoices in two fine ports. In addition, Carié claims that the free institutions of Réunion—the right of universal suffrage and more particularly the privilege of electing colonial representatives who sit in Paris—as compared with the deadening "administrative tyranny" of Mauritius, tend to make politics play altogether too important a part in everyday life. "La manne électorale, chez les Africains et chez beaucoup de petits blancs, remplace agréablement le travail." Though hardly venturing to do more than hint at the remedies that should be taken to do away with this evil, he suggests that for colonial representation some form of colonial home rule should be substituted and dreams of the ultimate formation of a *bloc français* in the Indian Ocean composed of Madagascar, Réunion, and Mauritius.

POLAR REGIONS

A Note on "Eskimo Stone Rows in Greenland." The stone monuments recorded by Porsild in the November number of the *Review* are very remarkable. As far as I can discover, there is no mention of hopping-stones, or of any hopping game, from any other Eskimo area, although the word *nangerpoq* "he hops," is known in Labrador and Hudson Bay. The game described by Porsild must surely have originated in western Greenland.

The stone fence at Saputit is also, I believe, without a parallel in Arctic America. It is true that hunting fences are mentioned by several explorers, but what they meant were lines of single stones, or sods of earth, or occasionally sticks and stumps of wood, set up at intervals of from 20 to 40 yards from one another. As a rule two such rows are erected, one on either side of a valley in which caribou are grazing. The women and children then drive the deer down between these lines, (which appear to the frightened game like the heads of hunters), either into a lake, where the men are waiting in their kayaks to spear them in the water, or else through a narrow gap where the hunters, armed with bows and arrows (nowadays often with rifles), shoot at them from the concealment of hollows and shallow pits. Old alignments of this nature are found everywhere from Alaska to Hudson Bay, and new ones are constantly being erected even now by the Eskimos around Coronation Gulf. The traveler will often find in their vicinity small circular or semicircular stone shelters where the hunters have lain in wait, and stone cairns where they have cached their meat. But true fences of stone have never been recorded outside of Greenland, unless one includes the low dams that block the mouths or outlets of the salmon creeks.

D. Jenness

MATHEMATICAL GEOGRAPHY

A Famous Seventeenth Century Map of Italy. The early seventeenth-century Paduan geographer and astronomer G. A. Magini compiled a large atlas of Italy, which was completed in 1604 though not published until 1620, after his death. In the latter year his son Fabio brought out this great monument of cartography consisting of no less than sixty detailed maps. The atlas, however, did not include a general map of the peninsula, the existence of which is indicated in documents concerning the Magini, and in a vain search for a copy of which many libraries had been ransacked, until about three years ago, when Professor R. Almagià of the University of Rome was fortunate enough to discover one. This forms the subject of a brief article in the March-April (1920) number of *L'Universo* (a new periodical issued by the Istituto Geografico Militare of Florence), and to it Professor Almagià intends to devote a more extensive discussion in a proposed work on the cartography of Magini.

The general map bears the title "Italia Nova di G. A. Magini." Drawn from data which had been used in making the Atlas, it was not published until 1608 on account of difficulties in securing the services of an engraver. Within its ample dimensions (115.5 x 89 centimeters), it depicts the whole of Italy and the shores of the Adriatic, but only the north-eastern corner of Sicily, and that, together with southern Sardinia and the tip of Calabria, in a state damaged beyond recognition. On the undamaged parts of the map the wealth of detail is extraordinary both in place names and in the representation of river systems; the principal chains of Alps and Apennines are also shown, together with political boundaries of two grades of importance.

Magini, through his connections with Francesco Gonzaga, prince of Mantua and Montferrat, and with other influential persons at the courts of Italy, undoubtedly had access to unpublished official and private documents. By the use of these materials he was enabled to compile a map superior to those of all of his contemporaries. Reproductions of his "Italia Nova" are now very rare though there are in existence a few which were published at later dates and with slight modifications of the original. On the other hand, as Almagià explains, the data contained in the map "reduced and simplified for the purposes of convenience but without any noticeable improvement and without bearing the author's name, entered into many of the famous foreign atlases like those of Hondius, Blaeu, Janson, Visscher and Seuter. In this way the map exerted an immense influence on the cartography of the sixteenth century, and, recognized probably by all as the best product of its epoch, enjoyed for about a century a well-earned fame."

PHYSICAL GEOGRAPHY

The Growth and Needs of Oceanography. This year for the first time in the history of the British Association the presidential address was delivered by an oceanographer (*Nature*, August 26, 1920, and *Science*, September 3, 1920). It is fitting, therefore, that Dr. Herdman prefaced the main theme of his speech by a sketch of the growth of this "youngest of sciences." For, according to the veteran oceanographer Buchanan, it was born "a little to the westward of Teneriffe on February 15, 1873," with the first oceanic sounding of the *Challenger*. To Buchanan's story "A Retrospect of Oceanography in the Twenty Years Before 1895," retold in his second collection of essays "Accounts Rendered of Work Done and Things Seen" (1919), Herdman adds comment on the preliminary work leading up to the first deep-sea expedition and in its most notable successors whereby in a comparatively short space of time "we know the distribution of temperatures and salinities over a great part of the surface and a good deal of the bottom of the oceans, and some of the more important oceanic currents have been charted and their periodic variations, such as those of the Gulf Stream, are being studied. We know a good deal about the organisms floating or swimming in the surface waters (the epiplankton), and also those brought up by our dredges and trawls from the bottom in many parts of the world although every expedition still makes large additions to knowledge."

The field of oceanography, which is described as of a peculiarly "annectant" character, has broadened to a vast range of problems. Many of these have an unusual interest for the layman because of their practical bearing. Take for instance the study of deep-sea deposits commenced by Murray on the *Challenger*. Among the results of Murray's researches was the discovery of phosphate rock off Christmas Island (south of Java)—a discovery

which has already brought the British government a revenue exceeding the total cost of the *Challenger* expedition.

During the war knowledge of the chemistry and physics of the ocean—of salinity and currents—proved of great value in regard to submarine operations and drifting mines (see note below,„"The Drift of Mines in the North Atlantic"). In his outline of problems before the science of oceanography Herdman however confines himself to the biological side . . . "the ultimate causes of variations in the abundance, in the sizes, in the movements, and in the qualities of the fishes of our coastal industries." Alike from the extensive and the intensive points of view this dominantly economic side of oceanography—the ocean as a food reserve—is in need of investigation. New fishing grounds await discovery. In the discussion following the presidential address there was instanced the case of the vast shallow water area (under 100 fathoms), extending from around the Falkland Islands to Montevideo, of which our knowledge is limited to the results of eight trawling records, two by the *Challenger*, six by the *Albatross*. It is needless to comment on the limited knowledge of the controls governing fluctuations of the sea harvests in our old established fishing grounds. There is the spectacular case of the tilefish which was discovered off Nantucket in 1879, disappeared in a wholesale destruction in 1882, and lately reappeared in numbers sufficient to maintain an important fishery. The responsible factor is held to be changes in temperature due to changes in régime of the currents, whence arises the practical question of the frequency of such changes.

The Drift of Mines in the North Atlantic. The oceanographical essays of Buchanan to which reference has been made above ("Accounts Rendered") include a description of

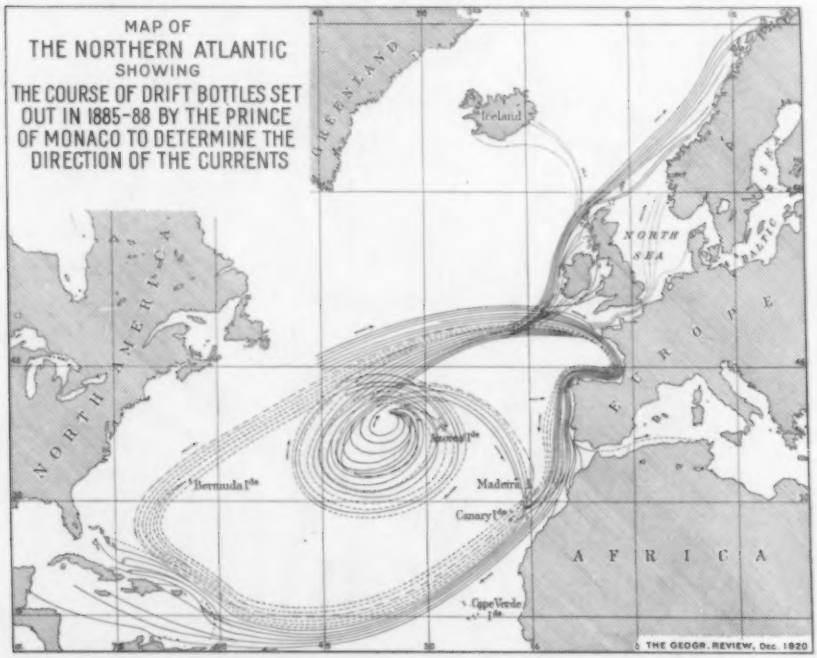


FIG. 1—Map illustrating the courses of drifting mines in the northern Atlantic.

one of the notable events in the history of oceanography—the establishment of the Oceanographical Museum of Monaco and an appreciation of the work of its founder, the Prince of Monaco. Perhaps the best known phase of this work is the series of observations on the currents of the North Atlantic based on the methodical dispersion of floats from the *Hiron-*

delle during the years 1885–1888. A recent practical result is the application to the break-up of the mine fields sown during the war in the waters of western Europe.

In general the drifting mines will follow definite courses whose routes are shown on the accompanying map (S. A. S. Albert, Prince of Monaco: Marche des mines flottantes dans l'Atlantique Nord et l'océan Glacial pendant et après la guerre, *Bull. ſ'Inst. Océanogr. No. 357*, 1919). Mines strewn in the northern waters (the North Sea and off western Britain) will be carried to the Norwegian fiords. In conjunction with the action of tides and storms in the narrow English Channel the course of mines is here more variable; of those not washed to either shore some will travel northward and others will join with those from off the western coast of France, Spain, Portugal, and Morocco. These enter into the great oceanic circulation drifting to the West Indies, and pass into the Gulf Stream to be lost in the circulation of the Sargasso Sea or to return, after a period estimated at about four years, to the mouth of the English Channel.

At certain points there will be a tendency to concentration of drifting mines. Such danger zones are the Gulf of Gascony between Bordeaux and Cape Finisterre; the western coast of Portugal and that of Morocco; the Canaries and Madeira; the Azores.

The Beauty of Geographical Features. The annual address of the President of the Royal Geographical Society, Col. Sir Francis Younghusband, is noteworthy for its appeal to the emotions rather than to the understanding, or perhaps to the emotions through the understanding (*Geogr. Journ.*, July, 1920). He holds that the beauty of the face of the earth is more worth "learning about, knowing, and understanding" than any other phase of geographical science. Younghusband's career as an explorer of innermost Asia and Tibet, and as administrator of Kashmir has given him an extensive knowledge of an overlarge continent, and his reports concerning places and peoples have been of much importance to the British government; but he regards his knowledge of the beauty of the mountains, plateaus, plains, and valleys in that vast region as "most worth having" and of "most geographical value." He urges, furthermore, that the beauty of a landscape should not only be enjoyed by the observer but should be adequately described by him so that it may be understood and enjoyed by many others. The description should not be "shallow rhapsodizing of the journalese and guidebook type, but true expression in which each noun exactly fits the object, each epithet is truly applicable, and each phrase rightly turned, and in which the emphasis is placed on the precisely right point, and the whole composed so as distinctly to bring out that point."

The address, which has set forth a high and admirable ideal, ought to serve as a timely antidote to the over-utilitarian form of geography which is now in vogue with educators probably on account of its vocational value. But the address leaves the reader in some uncertainty as to how far the beauty of a landscape is to be regarded as objective and inherent in the geographical reality, or subjective and evoked from the geographer's mentality. A solution of this uncertainty may be implied in the above-quoted opinion that an "understanding" of landscape beauty is well worth working for. If so, Younghusband should be regarded as a strong advocate of the explanatory description of land forms; for enjoyment grows enormously with their true interpretation, so much so indeed that a geographer who understands landscapes and recognizes the subtle meaning and relation of their parts finds beauty and charm in many a prospect that leaves an otherwise-minded observer unmoved. Even the barren landscapes of Tibet, with their uncounted alternations of rugged mountain ranges and smooth intermont plains, may have their "own particular beauty" to a traveler who is not blinded to their appeal by the difficulties of traveling over them. Nothing will help so much to struggle against blinding difficulties as a close scrutiny of the region around him in earnest and thoughtful search for the deep significance of its outward expression; that is, for the truth about it; and in just such measure as his search is rewarded will the real beauty of the region be perceived and the enjoyment of it grow. He will then feel more and more that "Beauty is truth, truth beauty."

W. M. Davis

GEOGRAPHICAL REVIEWS

Pioneer Studies of the West Patagonian Cordillera

Hans Steffen. **Westpatagonien: Die Patagonischen Kordilleren und ihre Randgebiete auf eigene Reisen gegründete Landschaftsdarstellung, verbunden mit einem Abriss der Erforschungsgeschichte des Gebiets.** Vol. 1, xiii and 358 pp.; maps, diagrs., ills.; Vol. 2, viii and pp. 359–670; maps, ills., bibliogr., index. Dietrich Reimer (Ernst Vohsen), Berlin, 1919. M. 60. 10 x 6½ inches.

The German colony which was planted in Chile by the grandfathers of the present generation, remains to this day characteristically German in customs and habits of thought, although intensely Chilean in national fealty. On a summer evening, when the band plays in the park of Osorno and the blond youths and maidens promenade decorously while the older people chat in true *Gemüthlichkeit*, it is hard to believe that one is not in Bavaria or Saxony. But Spanish mingles with or takes the place of the *Muttersprache*, and it is Chile, not the far-away Vaterland, for which young and old alike would fight. Also it is Argentina, not France, which is the hereditary enemy.

These facts are reflected in the work of Dr. Steffen, a Chilean of German parentage, on that part of Patagonia which he explored during the controversy between Chile and Argentina over the position of the boundary that should divide their respective dominions. The work is a retrospect, published seventeen years after the last of nine journeys undertaken between 1892 and 1902. It is marred throughout by the bitterness of the international dispute which prejudices the author against the similar work performed by the Argentines. It is, nevertheless, a record of original and in many localities initial observation, presented with characteristic German attention to detail.

The boundary dispute between Argentina and Chile, during the period from 1881 to 1902, concerned the interpretation of the treaty of 1881, which established two conditions to be fulfilled by the dividing line: it should follow the crest of the high Cordillera of the Andes and also the divide of the waters. Since the high crest and the divide do not agree, the commissioners espousing the interests of their respective countries disagreed. The Argentine commissioner was Francisco P. Moreno, explorer, geographer, and scientist. He utilized all the resources of the La Plata Museum, which he had founded and organized with the purpose of developing it into a Latin-American Smithsonian, to explore and survey the disputed territory. The resulting maps were used by the English arbitral commission, and Moreno was awarded the gold medal of the Royal Geographical Society for the contribution which he and his assistants had made to geographical knowledge.

Moreno's geographical contribution was in the same class as that of Hayden, Powell, and Wheeler in the United States. As their maps are being replaced by detailed surveys, so in time will his; but they must ever be regarded as remarkable results, achieved by intrepid explorers, inspired by the genius and indomitable purpose of their chief.

Dr. Steffen himself tells us what was the situation in Chile:

"The Chilean expert, Diego Barras Arana, historian and diplomat rather than geographer, would recognize only the continental divide as the governing fact by which to interpret the boundary treaty and its later protocols, and he subordinated to that concept all other orographic conditions, even indeed the requirement that the boundary should run 'in the Cordillera de los Andes' . . . In fact, according to the Chilean view the boundary question never was a truly geographical problem; it was rather a question of the analysis of the treaty and the subsequent delimitation on the ground according to the adopted principle, which should govern under all conditions. . . Nevertheless, the Chilean expert could not shut his eyes to the fact that exact knowledge of the geographical relations of the disputed zone would be advantageous, indeed often indispensable, and it was on this ground that I [Dr. Steffen] secured consideration from him when I proposed to the Chilean government that an exploring expedition should be organized."

The task which Dr. Steffen set himself in 1892 was matched in difficulty and uncertainty only by similar explorations undertaken in Alaska from 1896 on, by the United States Geological Survey. He proposed to ascend the Andean rivers to their distant sources, to

determine their courses and the true position of the continental divide. The approach to the mouth of any stream was through fog-enshrouded, often uncharted fiords. A landing was to be made on delta flats in forest swamps, or the swift current of the river was to be stemmed until, on reaching impassable rapids, the party should take to the trackless and frequently precipitous mountain side. Fiord-like lakes interrupted the rivers' impetuous fall. Sheer cliffs rose from the water and sank far below its surface, forbidding passage by shore. To traverse the lakes and cross the rivers folding boats were carried; but each craft required at least three carriers, adding seriously to the number to be fed. Provisions spoiled. The men, enduring wet, cold, and excessive labor, shrank from the ever-increasing difficulties of advance into the ice-covered heights of the Andes and were tempted by the comparatively easy retreat. The Chilotes or natives of the island of Chiloé, from whom the laborers of these expeditions were largely recruited, are akin to the Eskimos in stature, physiognomy, and temperament. Strong, enduring, and willing when pleased, they may become sullen or frightened like children. It then requires great tact to lead them further.

That under these difficulties Dr. Steffen successfully carried out nine arduous expeditions, that he persevered to the limit of human endurance, that he was repeatedly accompanied by the same crews, all goes to demonstrate his qualities as a man and a leader.

The geographical content of these volumes possesses the value of original detailed description. The author describes his own observations and experiences in tracing the river systems of the Cordillera, from latitude 41° southward. He divides the Andes into five sections which, beginning at the north, he designates according to the principal watersheds as the Llanquihue Cordillera between the Gulf of Reloncavi and Lake Nahuel Huapi, the Puelo Cordillera, the Yelcho-Palena Cordillera, the Cisnes-Aisen Cordillera, and the southern section of West Patagonia. Each section is treated under chapter headings corresponding to the history of exploration, general description, and detailed accounts of individual features, particularly of drainage systems.

The work is accompanied by a general map, scale 1:2,500,000, and by five route maps, scale 1:250,000. The streams are crudely traced on these maps, even where they have been followed, the characteristic meanders and angles being lost. The relief is shown by conventional brush shading, without any attempt to express even the most evident of the grander forms of the mountains. No effort appears to have been made to raise these maps above the standard of the author's original reconnaissance sketches, even in the regions where more accurate surveys have been executed, as for instance in the vicinity of Lake Nahuel Huapi and the interior valley south of it.

The author, in the course of his various expeditions, noted the distribution of the massive granite rocks, the basic lavas, the schists and the Tertiary sediments of the Andes and presents the facts at some length in an introductory chapter as well as in several geological sketches. He discusses the tectonic divisions of the Cordillera, chiefly to emphasize the unity of the mountain uplift in contradistinction to the concept of a main Cordillera flanked by an eastern pre-Cordillera, as described by F. P. Moreno.

The American student of physiography will look in vain in these volumes for any recognition of the facts and principles of landscape evolution as they are understood by him. The author indeed cannot be held responsible, but the lack of observation and interpretation of topographic forms is none the less regrettable. In order to comprehend the strange courses of the rivers which he followed with such indefatigable energy, he would have required that knowledge of physical features by which to distinguish the elements of the Pliocene and post-Pliocene history; namely, (1) the ancient topographic surface of post-mature relief which he wandered over near El Cerro Tronador and in which the Paso Raulies and Paso Bariloche mark old valleys; (2) the drainage captures which ensued upon the initial upwarping of that old surface and which transferred the headwaters of the principal rivers such as the Rio Manso, Futaleufu, and others from Atlantic to Pacific watersheds; (3) the erosion of deep canyons as a result of further uplift; (4) the deepening of those canyons and their transformation into fiords or fiord-like lakes by glaciation; (5) the discrimination of the effects of the older and younger epochs of glaciation and their minor influences upon the drainage system; (6) the effects of faulting in determining the positions of longitudinal valleys where they exist, as in the Lago Mascardi-Valle Nuevo trough. These facts have been recognized as essential elements of Cordilleran history in the section of the Andes lying around and south of Lake Nahuel Huapi as far as Diez-y-seis de Octubre, and there can be no doubt that a similar interpretation will eventually apply to all the chain. The work before us belongs, however, to the class of empirical

descriptions characteristic of the period before the key to physiographic interpretation had been discovered.

The general reader will, nevertheless, find in these pages a large amount of historical and geographical information and will enjoy the numerous excellent photographs which embellish the volume.

BAILEY WILLIS

THE NORTHEAST FRONTIER OF INDIA

L. W. SHAKESPEAR. **History of Upper Assam, Upper Burmah, and North-Eastern Frontier.** xvii and 282 pp.; maps, ills., index, bibliogr. Macmillan and Co., Ltd., London, 1914. $3.25. 9 x 6 inches.

Wherever the officers of the British Army have gone they have placed the sciences of geography and history under a deep debt of gratitude. Some of these energetic British have produced masterpieces, such as the travels of Younghusband; others have written racy volumes of a rather shallow nature; but the majority have given us painstakingly accurate works which show a deep and abiding enthusiasm but are obviously the work of amateurs both in science and in the art of writing.

The book under discussion is of this last kind—valuable and indeed indispensable to the student of northeastern India, decidedly interesting in spots, but somehow a little confusing. The writer feels the lure of the dense forests, the mighty mountains, and the childlike, irresponsible savages, but finds it hard to impart it to the reader.

The opening chapter puts before us the most absorbing of all problems in a country like Assam and Burmah—the cause of the striking contrast between a great past and a degenerate present. Three centuries or more before Christ the people of Assam were so civilized and energetic that they built stone cities like Kamatapur nearly nineteen miles in circumference. Today they are "a peaceful, almost effeminate race," few in number, addicted to opium, "and not disposed to diligent labor."

Colonel Shakespear suggests five reasons for this great change: (1) The moist, warm climate with its torrential rains soon enervates every race that enters the regions. (2) Frequent invasions from the north have overwhelmed the country again and again. (3) The Brahmaputra River has overwhelmed city after city. Between 1790 and 1860 it changed its course by no less than 50 miles. (4) Earthquakes are common here at the foot of the young Himalayas and have overthrown many of the ancient ruins. (5) The vegetation is so extremely dense that it quenches human ambition. Moreover, it is constantly spreading, and much that was open, cultivated land only a few centuries ago is now covered with almost impenetrable forest.

After so promising an introduction the reader hopes to find a real discussion of the points thus raised. Instead he finds chapter after chapter of minute details as to tribal wars and especially as to the various expeditions which ultimately resulted in the present system of British rule. Incidentally, to be sure, many interesting notes are introduced dealing with social, political, and religious customs. For example, in Bhutan, previous to 1842, there was for a while an odd arrangement whereby the district of Kalling was under native rule eight months of each year and under British rule the remaining four.

A chapter on ruins describes a most extraordinary series of great monoliths, some roughly hewn and suggesting a tropical Stonehenge; others beautifully carved. At Dimanpur a field of 64 elaborate monoliths, set in a background of wonderful forest, is remarkably suggestive of the Maya ruins at places like Quirigua in Guatemala. In fact no feature of Assam and the neighboring regions to the southeast is more striking or more puzzling than the close parallelism with the similar climatic region from southern Mexico southward. This parallelism displays itself not merely in the general decline in civilization but in the tendency toward massiveness in architecture, toward monoliths set up in rows, toward phallism when decadence set in, and in many other respects.

One of the most interesting parts of the book is the account of the curious customs of the Nagas and their neighbors, some of whom hunt heads as trophies while others hunt them merely to imbibe the strength of the decapitated victim. Where the author describes his own journeys he attains a vividness which is lacking elsewhere. The pictures are admirable, many being of unusual scenes such as the amazingly flimsy bridges of light canes which swing across the raging Himalayan streams.

The author himself apparently feels that one of the most important parts of the book is the suggestions as to reforms in British methods of dealing with wild tribes. When a

tribe commits depredations Colonel Shakespear advocates a quick, sharp punitive expedition, followed at once by road-building and the opening up of commerce. He also urges the payment of subsidies to influential natives to establish, as it were, a cordon of friendly wardens of the marches. Although he does not say so, his idea is "Speak gently and carry a big stick."

ELLSWORTH HUNTINGTON

A SYNTHESIS OF OUR KNOWLEDGE OF SOUTHERN TIBET

SVEN HEDIN. **Southern Tibet. Discoveries in Former Times Compared with My Own Researches in 1906–1908.** Vol. 1, xxxii and 293 pp.; maps, ill.: Vol. 2, xi and 330 pp.; maps, ills.; Vol. 3, xi and 369 pp.; maps, ills.; each 11 x 9 inches. **Atlas of Tibetan Panoramas**, 105 pls. (552 drawings), 15 x 12 inches. **[Portfolio of] Maps,** 1, 15 pls., 15 x 12 inches. Lithographic Inst. of the General Staff of the Swedish Army, Stockholm, 1917. $200.00.

These volumes, Hedin says, are the scientific account of his explorations in southern Tibet, his popular account having been published earlier. They have no index, and it would be difficult to find all they contain relating to any particular topic if it were not for the well-arranged table of contents in each volume. Logical arrangement of topics and clear, simple, interesting treatment of them are among the best features of this enormous production.

No field worker in geography has means of his own with which to finance the publication of so regal a work as this. Its price indicates that no expense has been spared to make it a conspicuous product of the press. Its publication in this form was made possible because the Swedish Diet authorized most of the expenses from the public funds. A fourth volume is under preparation.

These volumes include an able analysis of the work of all explorers who have endeavored to reveal the remote and unknown regions of southern Tibet. An attempt is made to sum up all phases of the work and to show southern Tibet as it now is. Of course there are limits to one man's ability to do all this, and Hedin claims nothing more than that he in some measure "has opened the way for future conquests in Tibet on the different fields of scientific research." He has certainly achieved much.

The first volume is given to the beginnings of our knowledge of southern Tibet and to the ancient maps of Tibet and of the great Indian rivers that head in that country. This volume includes 53 maps dating from the fifteenth century to 1830, when the Chinese map of Tibet was published. They constitute a fine record of the gradual progress made in our knowledge concerning a very difficult region and of the slow improvement in methods of cartographic delineation during five centuries. Hedin makes many comments on the maps and on the geographical opinions and methods of the early days.

The second volume deals with modern exploration in southern Tibet, and nearly half of it is given to the Tsangpo River and its source. Some readers may recall the fact that, for generations, the source and the outlet of the Tsangpo were among the conundrums of Asian geography. It remained for Hedin to discover its source and to prove, as had already been suspected, that this great Tibetan river is really the upper Brahmaputra. The headwaters of the Brahmaputra are thus hundreds of miles to the west of the region within which, even less than a generation ago, the river was supposed to have its rise. In this territory, as in all others, Hedin combines with his own work the results, good or inferior, of the work of his many predecessors in the same field, thus giving in broad outline a comprehensive view of all geographical activities in every region as far as geographical history records them.

In the third volume the author concludes his history of all that was known of Tibet down to 1906; and the latter half of the book is given to his own journeys, describing in considerable detail each of his eight crossings of the Trans-Himalayas that have contributed in an important degree to our knowledge of this gigantic mountain system. He had to see everything himself, as he could not depend upon any native statements. He regards his work among the mountains as merely a pioneer effort, and it remains for future explorers to fill in the details.

Besides the reproduction of numerous old and later maps and of maps drawn by himself, the volumes contain a large number of exquisite half-tones and of views in color.

Accompanying the volumes is a "General Map of Central Asia and of Tibet," in colors, by Hedin, scale 1:7,500,000; 2 sheets of a "General Map of Eastern Turkestan and Tibet," in colors, 15 sheets, scale 1:1,000,000; and 12 sheets in colors showing the topography on both sides of Hedin's route, scale 1:300,000. These route sheets well illustrate a phase of the remarkable activity of this explorer, which is even more vividly accentuated in his "Atlas of Tibetan Panoramas." The atlas contains 552 sharply defined pen-and-ink sketches, chiefly of mountain ranges or bits of plateaus, with frequent notations along each panorama showing the bearings of the place as indicated from the draftsman's position.

These volumes and the Hedin maps are a most creditable achievement of one of the great geographers of the time.

CYRUS C. ADAMS

A SCIENTIFIC JOURNEY IN THE HWANGHO REGION OF CHINA AND TIBET

ALBERT TAFEL. **Meine Tibetreise: Eine Studienfahrt durch das nordwestleiche China und durch die innere Mongolei in das östliche Tibet.** Vol. 1, xi and 352 pp.; map, diagrs., ills.; Vol. 2, 346 pp.; map, diagrs., ills., index. Union Deutsche Verlagsgesell., Stuttgart, Berlin, Leipzig, 1914. M.24. 10 x 7 inches.

Dr. Tafel started on his journey, in the middle of China, in March, 1905, and was three years on his way through China and the eastern part of Tibet and back, the entire journey without white companion. His book is unusual in some respects and presents many facts and deductions so clearly that it is easy to grasp and assimilate them. The reader can see what the author describes, and the text is reinforced by a large number of superb half-tone illustrations. The forms of the land, the denudation wrought by natural processes, and other geographical types are clearly defined. So, too, is human life in its various forms—the homes, the industries, and the well-being or misfortunes of the peoples he met.

In the author's four years' journey he traced in China and Tibet more than two-thirds of the course of the Hwangho. His folded panoramic views, both in western China and in Tibet, are unsurpassed, though Sven Hedin shows a larger variety of superb views of Tibetan landscapes and phases of human and other life in his "Southern Tibet," 1917, discussed above. Tafel's studies of the northwestern part of China are more intensive than those he made in Tibet, partly because that remote section of China is still open to scientific research on a large scale and partly because such danger as environed his party in Tibet did not distract his attention in China.

Friendly Tibetans, near the eastern border of their country, had grave misgivings when they found that the explorer hoped to penetrate far into the land. For many weeks, however, he was kindly received. He noted, at first, the clearness of the air and the fact that he could see small objects at great distances. In a valley 15 miles away he saw moving white specks which his glass revealed as sheep feeding on the yellow grass. Many antelopes and other animals were wandering over the plains, for Tibet is not a dead country, but is full of life. He would have been glad to turn his own animals out to graze, but he was in a barbarous land and robbers would have stolen them.

As the explorer reaches monastery towns or the thinly scattered huts of the people, he tells what is known of the history of that part of the Mongol race which settled in Tibet and were the ancestors of the present inhabitants. The greatest influence there is Lamaism, a corrupt form of Buddhism; and it is partly their religious faith that has made the people so intolerant of the presence of strangers in their land. Gumbum, their largest monastery center, is a rather imposing walled town with a large population, including many hundreds of priests. During the religious festivals, thousands of pilgrims from all over Tibet are assembled at Gumbum.

The explorer did not completely cross Tibet from east to west as he had hoped to do. He did not see Lhasa, the chief town, though he was far on his way to it. He had made good progress for some months in temperatures that were usually below the freezing point. But his hopes were finally blasted in an hour. At Camp No. 88 his party was attacked at night by mounted Tibetans who surrounded the expedition, wounded one of his men, drove off his baggage animals, and sped away carrying with them some of the most important articles of his equipment. There was nothing to do but to retreat. Fortunately, the party had eight draft yaks left, enough to carry all the more important part of their remaining equipment, and they retained their guns and ammunition. So they turned back, taking a more southerly route; and Tafel resumed his studies of the country around him. The party suffered, at times, from hunger but more from cold. Snow averaging a foot in depth made travel arduous.

CYRUS C. ADAMS

THE SAN JUAN DISTRICT, PORTO RICO: ITS PHYSIOGRAPHY AND GEOLOGY

D. R. SEMMES. **The Geology of the San Juan District, Porto Rico.** Map, diagrs., ills., bibliogr. Scientific Survey of Porto Rico and the Virgin Islands, Vol. 1, Part I, pp. 33–110. N. Y. Acad. of Sci., 1919.

The above geological report, published by the New York Academy of Science as part of its "Scientific survey of Porto Rico and the Virgin Islands," begun in 1914 and conducted jointly with the Porto Rico government, deserves the attention of geographers if only for the excellent quality of its second paragraph. The first paragraph briefly explains that the district described lies in the northern half of the island, of which it is typical, the second compactly states: "The physiographic history of the San Juan district is that of a complex mountainous oldland, which has been peneplained, partially submerged, overlapped by a coastal plain, uplifted, maturely dissected, again slightly submerged and partially uplifted, erosion continuing in the interior from the time of the first uplift." Thus the reader immediately acquires at the outset a general concept of the area studied, upon which a multitude of refining details are embroidered in the following pages. As the object of the study was geological, the quoted statement is phrased historically; but a geographical paraphrase can be easily prepared from it.

The mountainous oldland is "merely the eroded crest of a submerged mountain range of great complexity and magnitude," its axial altitude being about 2,500 feet. In the interior it has "attained the maximum ruggedness characteristic of a fully mature stage in topographic development;" its form there is "predominantly that of the ridge or *cuchilla* [knife] type," the minutely ravined slopes of the ridges descending at angles of 30° or 40° into close-placed, V-shaped valleys of dendritic (insequent?) arrangement, at the head of which the streams still have cascades. Yet a broad view shows that the innumerable ridges possess a general accordance of crest-line altitudes, as if they had been carved in a possible uplifted peneplain, of which occasional undissected uplands are taken to be remnants. Surmounting elevations, from 3,600 to 3,800 feet in altitude, are regarded as monadnocks. The rocks of the oldland yield various metals, including gold and platinum, in small quantities. Of special significance in the rock composition is the small proportion of quartz. Weathering gives rise to a very impervious clayey soil. It is to this fact that the remarkable stability of the soil mantle may be attributed. Hillsides that slope as steeply as 40° are susceptible of cultivation with little loss of soil. The northward decline of the mountains leads to their disappearance with decreasing relief beneath the coastal plain; but their marginal altitudes vary so greatly that the peneplain-thereabouts was either not well developed, or has suffered later warping.

The coastal plain has a belted relief. Adjoining part of the mountain border is a longitudinal inner lowland, excavated along the strike of weak clays and marls, the basal members of the coastal plain series. Next comes a dissected cuesta maintained by relatively resistant limestones, in part of coral reef origin. Where best developed, the cuesta inface rises abruptly from the inner lowland. The cuesta upland is elaborately dissected, showing many small, isolated, or "haystack" hills rising over plain areas that stand in terrace-like arrangement at lower and lower levels toward the coast. There are many caves in the limestone hills, some of which contain bat guano, locally used as a fertilizer. In consequence of slight changes of level since its erosion, the dissected coastal plain has an irregular outer margin, which is adjoined by lowlands or playa plains several miles in width, formed of outwashed detritus. Their surface being only a few feet above sea level, they are occasionally flooded by heavy rains and on-shore hurricanes. The playa plains are occasionally interrupted by low, isolated outliers of the partly submerged coastal plain; their outer margin is bordered along the shore by a belt of low sand dunes which, formed as an offshore sand reef, may have preceded and aided the formation of the playa plains. Until recently the playa plains were largely covered with swamp, but, "since the value of the land has been recognized for sugar-cane production, all the available areas have been drained and now constitute the most productive and valuable lands on the island." The city of San Juan lies on the western extremity of an offshore belt of consolidated sand dunes that encloses a lagoon harbor.

W. M. DAVIS

Farm Types in Nebraska

R. R. Spafford. **Farm Types in Nebraska as Determined by Climate, Soil, and Economic Factors.** *Agric. Exper. Sta. Research Bull. No. 15.* Lincoln, Neb., 1919.

Type areas for study in this bulletin are based primarily on temperature and rainfall and secondarily on soils. "Considered on any large geographical scale," says the author, "soil effects are often submerged by climate. The reverse is true in comparatively small areas of agricultural land. Here variations in soil often have sufficient range to outweigh the comparatively small range of climatic variations." Annual crop groups are largely limited by temperature. They fall into three main groups: (1) fall or winter, (2) spring, and (3) summer annuals. Winter annuals are seeded in the winter, spring annuals are seeded in late winter or early spring, and summer annuals are seeded in late spring or early summer.

The unit for crop temperature is the *month-degree.* This is determined by adding the total normal mean monthly temperatures above freezing and subtracting from this sum the product obtained by multiplying 32 by the number of months having mean monthly temperatures below freezing. In Nebraska the crop group areas, whether spring-summer, winter-spring, etc., show a general east-west grouping and vary from south to north roughly with the insolation. The comparative uniformity of altitude and other secondary climatic factors in this state makes the grouping relatively simple.

Rainfall in Nebraska decreases from 32 inches in the east to 16 inches in the extreme west. It is found that the size of farms increases with decrease of rainfall; for low rainfall produces low crop yields and short pastures, and larger acreages are therefore necessary to provide yields equal to those of eastern Nebraska. Thus in the eastern counties the average farm varies in size from 171 to 229 acres, while in the High Plains of the extreme western part the farms average 1,129 acres; in the western Sand Hills Region, which is both dry and sandy, the farms average 1,781 acres.

Mr. Spafford, who is now a member of the U. S. Bureau of Farm Management, has produced an interesting and valuable study of the relations of geographic factors to rural economics and sociology, a study which might well be followed in other states. Despite the title, very little attention is given to soils, and they are not described when mentioned; a general soil map of the state would be very useful. The bulletin is "meaty," and in places close attention is necessary to follow the author; but the numerous graphs are of much aid in presenting many facts in condensed form. Although the treatment is not formally geographical, this bulletin, not only in its subject matter but also in the method of approach to the problems, is a valuable contribution to geography.

F. V. Emerson (deceased)

A Primer of Tropical Hygiene

J. W. Ritche and M. A. Purcell. **Sanitation and Hygiene for the Tropics.** With an introduction by D. P. Barrows. xi and 434 pp.; diagrs., ills., index. World Book Co., Yonkers, 1918. $1.00. 7½ x 5¼ inches.

No more beneficent work can be done in the public schools than to teach well the laws of health and sanitation. In a tropical country the work is doubly needed. This volume was written primarily to conserve health and to decrease illness in the Philippine Islands. In consequence, its illustrations are drawn largely from the Islands, and it lays particular emphasis on diseases which are endemic there—malaria, tuberculosis, leprosy, cholera, and smallpox. The volume is divided into two sections. Book I unfolds for the pupils of the Philippine schools the germ theory of the various diseases with special directions as to the way to avoid contagion. It is a book of first aid and simple treatments, simply stated and carefully and effectively illustrated. Book II is a treatment of physiology and hygiene, an appeal through the knowledge of the body and its functions for the proper use and care of it. The entire treatment is well adapted for school use, and the authors are to be congratulated on their success in organizing and presenting so much valuable material interestingly enough for immature minds. Editions of this same book adapted to the United States proper have been issued under the titles of Primer of Sanitation, Primer of Hygiene, and Primer of Physiology.

Robert M. Brown

THE WORK OF THE BRITISH RAINFALL ORGANIZATION

H. R. MILL AND C. S. SALTER. **On the Distribution of Rain in Space and Time Over the British Isles During the Year 1918 as Recorded by About 5,000 Observers in Great Britain and Ireland, and Discussed with Articles Upon Various Branches of Rainfall Work.** 242 pp.; maps, diagrs., ill. *British Rainfall*, Vol. 58, 1918. Edward Stanford, Ltd., London, 1919. 8½ x 6 inches.

On July 25, 1919, the responsibility for the management of the British Rainfall Organization was transferred by the Trustees of that body to the Director of the British Meteorological Office. According to the terms of the transfer, the publication of *British Rainfall* will be continued under the auspices of the Meteorological Office. The present volume is, therefore, the last of the long series to appear as the independent publication of that unique rainfall organization which has done such important work ever since its foundation by the late George J. Symons. The present issue appropriately contains, as its frontispiece, an excellent half-tone portrait of Dr. Mill, who has now retired as Director of the British Rainfall Organization. The *Review* has already contained (September, 1919, pp. 194–195) an account of the important features of the rainfall of 1918. We may, however, here call attention to Dr. Mill's appreciative and very personal account of the development of the British Rainfall Organization since 1910; and to Mr. Salter's study of the relation of rainfall to configuration. The usual complete and well-arranged tabulations and critical discussions occupy the larger part of the volume.

Meteorologists the world over have distinct cause for congratulation in the fact that the British Rainfall Organization is to be continued on a firm basis, as part of the Government's scientific activity, and that *British Rainfall* will appear as the regular annual publication of that service.

R. DEC. WARD

THE GEOGRAPHICAL REVIEW

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OUR CONTRIBUTORS

Dr. Fleure holds the recently established chair of geography in the University of Wales, Aberystwyth. He is secretary of the Geographical Association (of Great Britain) and editor of its magazine, *The Geographical Teacher*. Dr. Fleure is well known as an exponent of human geography to which study he brings his allied work in zoölogy and anthropology. He is the author of "Human Geography in Western Europe" (1918). To the *Review* (March, 1918) he contributed the article "The Racial History of the British People.

Dr. Cleland is professor of geology at Williams College. His geological works include the textbook "Physical and Historical Geology" (1916). Among his geographical writings note may be made of an excellent paper, "Curaçao, A Losing Colonial Venture" published in the *Bulletin of the American Geographical Society* (Vol. 41, 1909).

Dr. Kindle is paleontologist in charge of invertebrate paleontology, Geological Survey of Canada. Previously to this appointment he was associated with the Geological Survey of the United States as geologist and paleontologist. Dr. Kindle has recently carried out investigations in the Mackenzie River Basin, an outcome of which is the present paper.

Dr. Alcock is a member of the Geological Survey of Canada. His work has carried him mainly into the Canadian Northwest, on a personal knowledge of which region is based the article "Past and Present Trade Routes to the Canadian Northwest" recently published in the *Review* (August, 1920). On one of his expeditions, in 1915, he surveyed the Churchill River to Fort Churchill on Hudson Bay. He contributed an article on this river to the *Geographical Review* (December, 1916). The present article is based on field work of subsequent seasons.

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Map of Eastern Labrador, by MRS. LEONIDAS HUBBARD, JR. 1:1,584,000. 1906. Embodies original survey of the George and Nascaupee Rivers across eastern Labrador from Ungava Bay to the Atlantic.

Map of the Catskill Mountains. 1:190,080 (3 miles to 1 inch). 1907. Generalized from the topographic sheets of the U. S. Geological Survey.

Mercator's Map of the World, 1538. Facsimile in black-and-white, reproduced from the original in the Society's collection (only two original copies of this map are known). 1885.

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